IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

April 24, 2016 and April 25, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

December 10, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On April 24, 2016 and April 25, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007), Calexico (AQS Site Code 060251003), Niland (AQS Site Code 060254004), and Westmorland (AQS Site Code 060254003), California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Federal Referenced Method (FRM) Size-Selective Inlet (SSI) High Volume Gravimeter sampler and the Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) both measured (midnight to midnight) 24-hr averaged Particulate Matter less than 10 microns (PM_{10}) concentrations of 186 µg/m^3, 218 µg/m^3, 177 µg/m^3, 285 µg/m^3, 173 µg/m^3, 225 µg/m^3 and 244 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley, Calexico, Niland, and Westmorland were the only stations in Imperial County to measure exceedances of the PM_{10} NAAQS on April 24, 2016 and April 25, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON APRIL 24, 2016 AND APRIL 25, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
4/24/2016	**Brawley**	**06-025-0007**	**1**	**24**	**186**	**150**
4/24/2016	**Brawley**	**06-025-0007**	**3**	**24**	**218**	**150**
4/24/2016	**Westmorland**	**06-025-4003**	**3**	**24**	**177**	**150**
4/25/2016	**Brawley**	**06-025-0007**	**3**	**24**	**285**	**150**
4/25/2016	**Calexico**	**06-025-0005**	**3**	**24**	**173**	**150**
4/25/2016	**Niland**	**06-025-4004**	**3**	**22**	**225**	**150**
4/25/2016	**Westmorland**	**06-025-4003**	**3**	**24**	**244**	**150**
4/24/2016	Calexico	06-025-0005	3	24	65	150
4/24/2016	El Centro	06-025-1003	4	24	49	150
4/24/2016	Niland	06-025-4004	1	24	96	150
4/24/2016	Niland	06-025-4004	3	24	127	150
4/25/2016	El Centro	06-025-1003	4	**23**	152	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On April 24, 2016 and April 25, 2016 one of a

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2016 Pacific Daylight Time (PDT) is March 13 through November 6. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

series of Pacific weather systems and associated passing dry cold fronts, created high winds that entrained fugitive windblown dust elevating particulate matter impacting monitoring stations in Imperial County (**Table 1-1**).

This report demonstrates that a naturally occurring event caused an exceedance observed on April 24, 2016 and April 25, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedances of 186 $\mu g/m^3$, 218 $\mu g/m^3$, 177 $\mu g/m^3$, 285 $\mu g/m^3$, 173 $\mu g/m^3$, 225 $\mu g/m^3$ and 244 $\mu g/m^3$ (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER).[2]

I.1 Demonstration Contents

Section II - Describes the April 24, 2016 and April 25, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley, Calexico, Niland, and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley, Calexico, Niland, and Westmorland stations this section discusses and establishes how the April 24, 2016 and April 25, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the April 24, 2016 and April 25, 2016 event and its resulting emissions defining the event as a "natural event".[3]

Section IV - Provides evidence that the event of April 24, 2016 and April 25, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

As early as April 19, 2016 the ICAPCD posted notices advising the public of the potential of a storm system by late Friday April 22, 2016. The April 20, 2016 and April 21, 2016 notices posted by the ICAPCD advised of breezy to gusty west winds through the weekend along the mountains and deserts to the west of Imperial County. Similarly, the San Diego National Weather Service (NWS) office issued daily notices updating the public on a series of Pacific weather systems moving into California. Unlike the Phoenix NWS office, the San Diego NWS office issued the earliest Urgent Weather Message with wind advisories April 21, 2016. By April 23, 2016 the San Diego NWS office issued an expiration notice during the early morning hours only to reissue an Urgent Weather Message during the evening hours the same day. These Urgent Weather Messages were repeated through the late evening hours of April 25, 2016. The Phoenix NWS office did not begin to issue Urgent Weather Messages until the early morning hours of April 24, 2016.

In any event, the Phoenix NWS office Weather Briefings issued Saturday, April 23, 2016 and Sunday, April 24, 2016 advised of strong winds, which would cause patchy blowing dust/sand, valid through Monday, April 25, 2016. The weather stories issued by the Phoenix NWS office for April 24, 2016 and April 25, 2016 both provided information regarding the movement of the “next” Pacific weather system, the dry cold front and the strong westerly winds between 30 and 50 mph with gusts over 40 mph creating favorable conditions for lowered visibility due to blowing dust and sand. Similarly, the San Diego NWS weather story issued April 24, 2016 forecasted the strongest winds across the mountains and desert slopes, with blowing dust and sand through Monday, April 25, 2016. The issued forecast warned of structural damage in the deserts due to the high winds. Both the San Diego and Phoenix NWS offices issued wind and blowing dust and sand advisories for San Diego, Riverside, Imperial and Arizona. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day in Imperial County for April 24, 2016 and April 25, 2016. **Appendix A** contains copies of notices for April 24, 2016 and April 25, 2016.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley, Calexico, Niland, and Westmorland monitors on April 17, 2017. The INPEE, for the April 24, 2016 and April 25, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days during 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for April 24, 2016 and April 25, 2016. The submitted request included a brief description of the meteorological conditions for April 24, 2016 and April 25, 2016 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 10, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 186 $\mu g/m^3$, 218 $\mu g/m^3$, 177 $\mu g/m^3$, 285 $\mu g/m^3$, 173 $\mu g/m^3$, 225 $\mu g/m^3$ and 244 $\mu g/m^3$, which occurred on April 24, 2016 and April 25, 2016 in Brawley, Calexico, Niland and Westmorland. The final closing date for comments was February 12, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial

County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the April 24, 2016 and April 25, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on April 24, 2016 and April 25, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event “is not reasonably controllable and not reasonably preventable.”
- e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”
- f The event is a “natural event” where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley, Calexico, Niland, and Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II April 24, 2016 and April 25, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the April 24, 2016 and April 25, 2016 event unfolded in Imperial County. The subsection elements include

» A description and map of the geographic setting of the air quality and meteorological monitors
» A description of Imperial County's climate
» An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**.The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

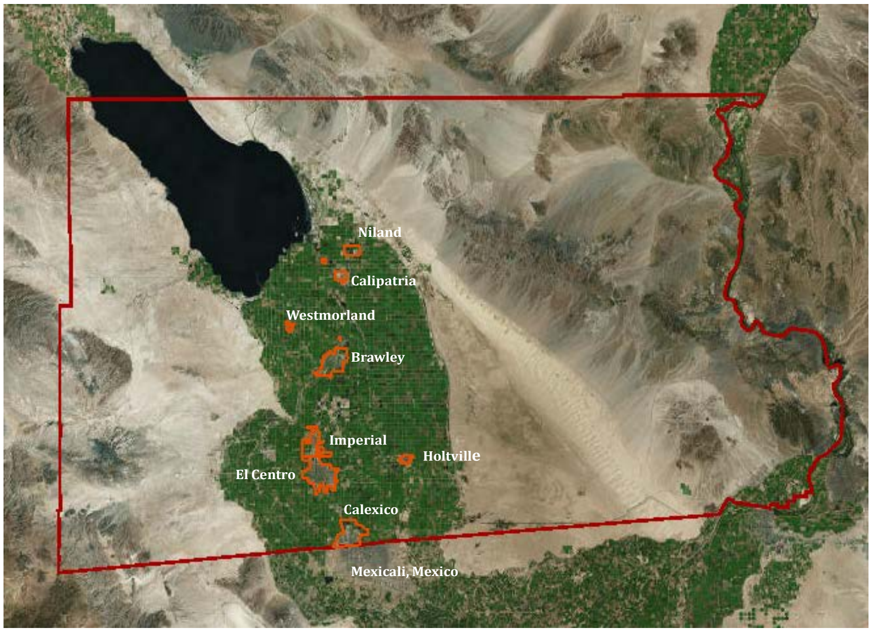


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, and the City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

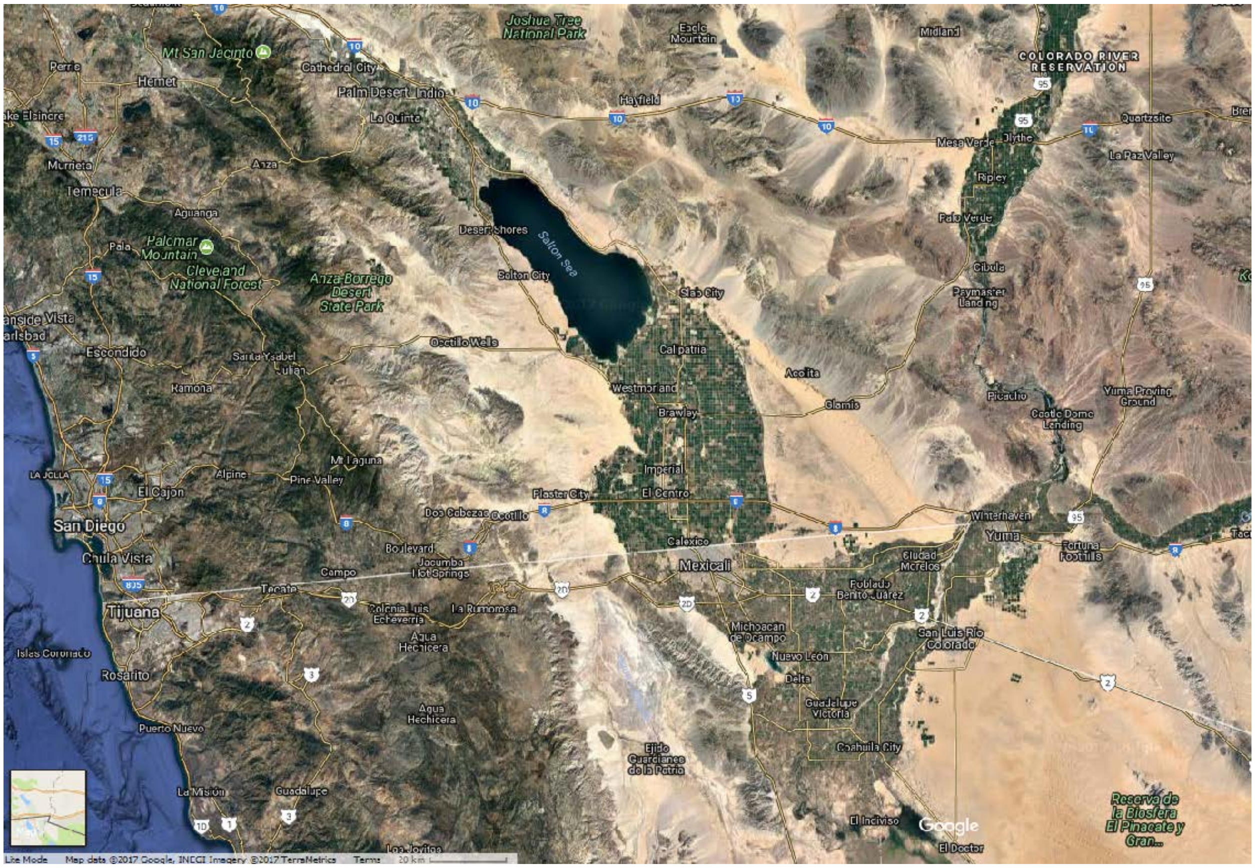


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics.

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8)**.

As mentioned above, the PM_{10} exceedances on April 24, 2016 and April 25, 2016, was a regional event with elevated concentrations at all monitoring sites. However only the Brawley, Calexico, Niland, and Westmorland monitors exceeded the NAAQS. Although the El Centro monitor measured elevated concentrations, it fell short of an exceedance at 152 µg/m^3. In order to properly analyze the contributions from meteorological conditions occurring on April 24, 2016 and April 25, 2016, varying meteorological sites were used, such as airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and when relevant to the wind event, meteorological sites within northern Mexico. (**Figure 2-8)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

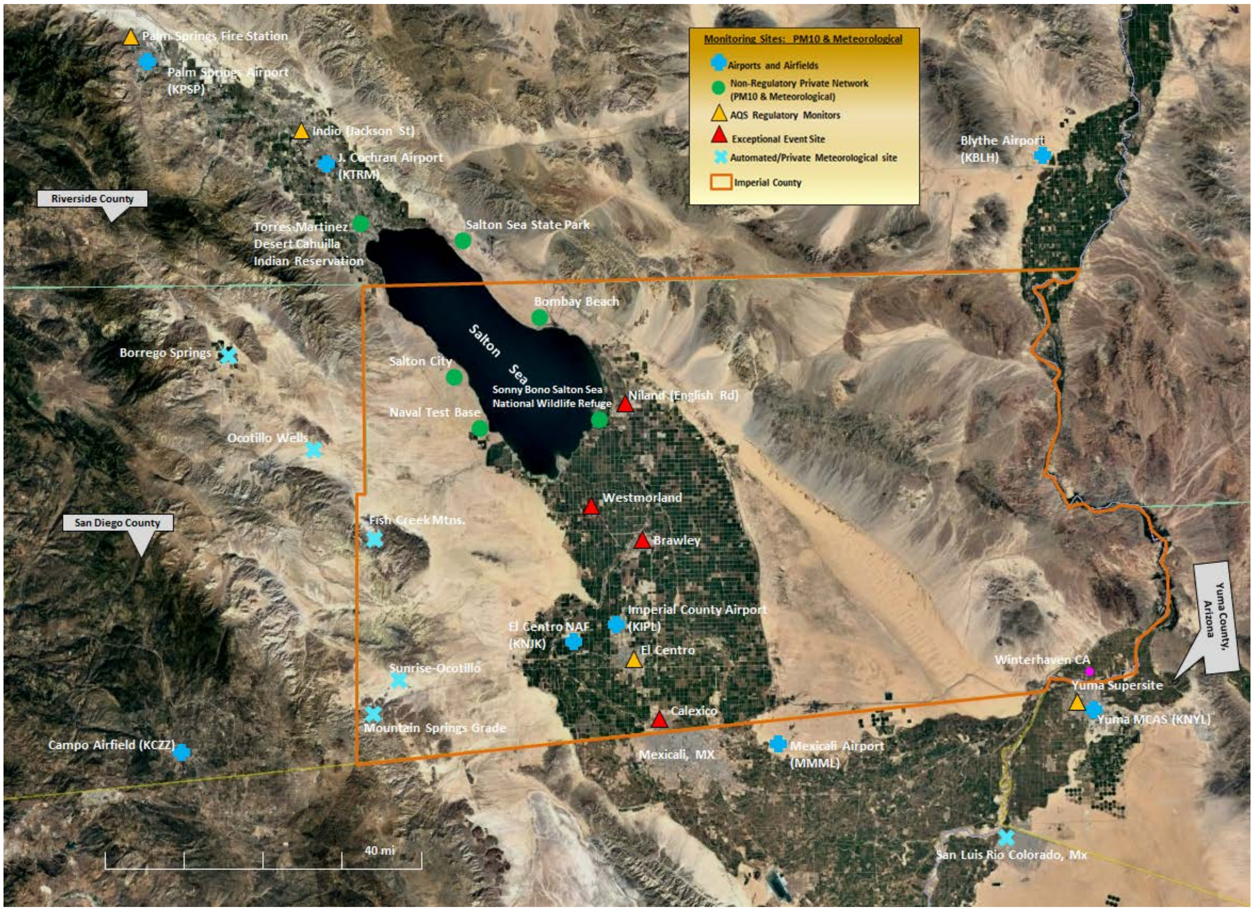


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. To view site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

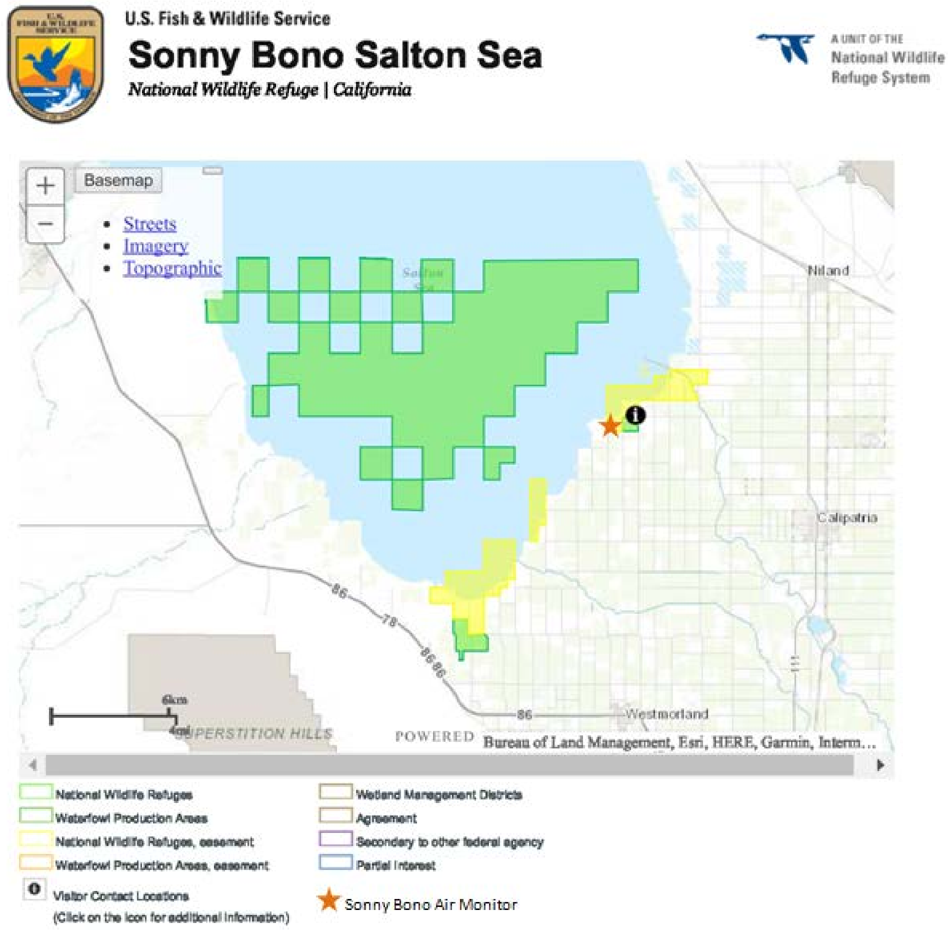


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
APRIL 24, 2016 AND APRIL 25, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	Day	24-hr PM_{10} (µg/m³) Avg	1-hr PM_{10} (µg/m³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY												
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	81102	13701	-15	24	186	-	-	-	-
		BAM 1020						218	995	1800		
		Hi-Vol Gravimetric					25	-	-	-	-	-
		BAM 1020						285	797	1700		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	81102	13698	3	24	65	333	2000	14.7	2000
							25	173	358	1600	17.8	1900
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	81102	13694	9	24	49	317	2300	16.7	2000
							25	24	663	0100	19.6	1400
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	81102	13997	-54	24	96	-	-	20.7	2200
		BAM 1020						126	582	1700		
		Hi-Vol Gravimetric					25	-	-	-	32.4	1700
		BAM 1020						225	685	1700		
Westmorland	ICAPCD	BAM 1020	06-025-4003	81102	13697	-43	24	177	995	1800	12.9	1700
							25	244	596	1800	21.1	1800
RIVERSIDE COUNTY												
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	81102	33137	174	24	19	43	1900	10	1400
							25	33	284	1200	6	1700
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	81102	33157	1	24	29	85	1600	13	1900
							25	49	230	1700	16	1700
ARIZONA – YUMA												
Yuma Supersite	ADEQ	TEOM	04-027-8011	81102	N/A	60	24	40	128	1800	-	-
							25	201	548	300	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question
April 25, 2016 was not a scheduled sampling day for the FRM monitors

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km²). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64” (**Figure 2-16**). During the 12 month period prior to the April 24, 2016 and April 25, 2016 event, Imperial County measured a total annual precipitation of 1.78 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

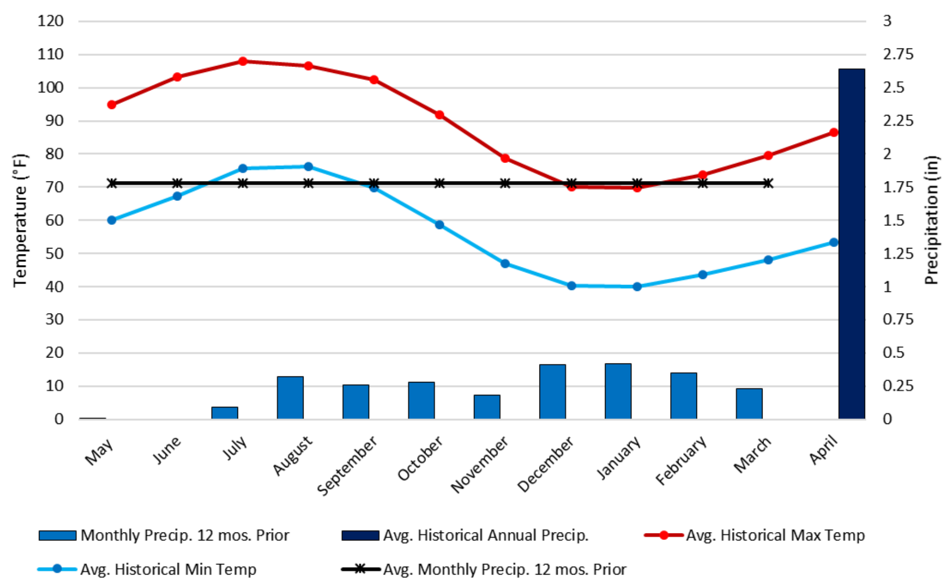


Fig 2-16: Historical Imperial County weather. Prior to April 24, 2016 and April 25, 2016, the region had suffered abnormally low total precipitation of 1.78 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground https://wrcc.dri.edu/

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for April 24, 2016 and April 25, 2016, which was caused by a Pacific weather system and associated dry cold front promoted strong gusty westerly winds through southern California. The Pacific weather system was one of a series of passing systems that began as early as April 21, 2016. The previous system promoted the creation of gusty west winds as early as Friday, April 22, 2016 diminishing prior to the entry of this system on Saturday, April 23, 2016 during the early morning hours. By April 24, 2016 a deepening of an upper level trough began across the west coast moving east. With the strengthening of the onshore flow strong westerly winds continued through Monday night April 25, 2016. On April 24, 2016 and April 25, 2016 strong gusty westerly winds swept across southeastern California as a Pacific weather system moved through the region affecting air quality and causing exceedances in Brawley, Calexico, Niland and Westmorland.

Figures 2-17 through 2-19 provide information regarding the expected movement of the upper level low moving over the region, the subsequent tightening of pressure gradients at the surface, and the resulting winds across the region. These images combined summarize the information

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

regarding the timing, speed and direction of the winds.

FIGURE 2-17
UPPER LEVEL TROUGH APPROACHES REGION

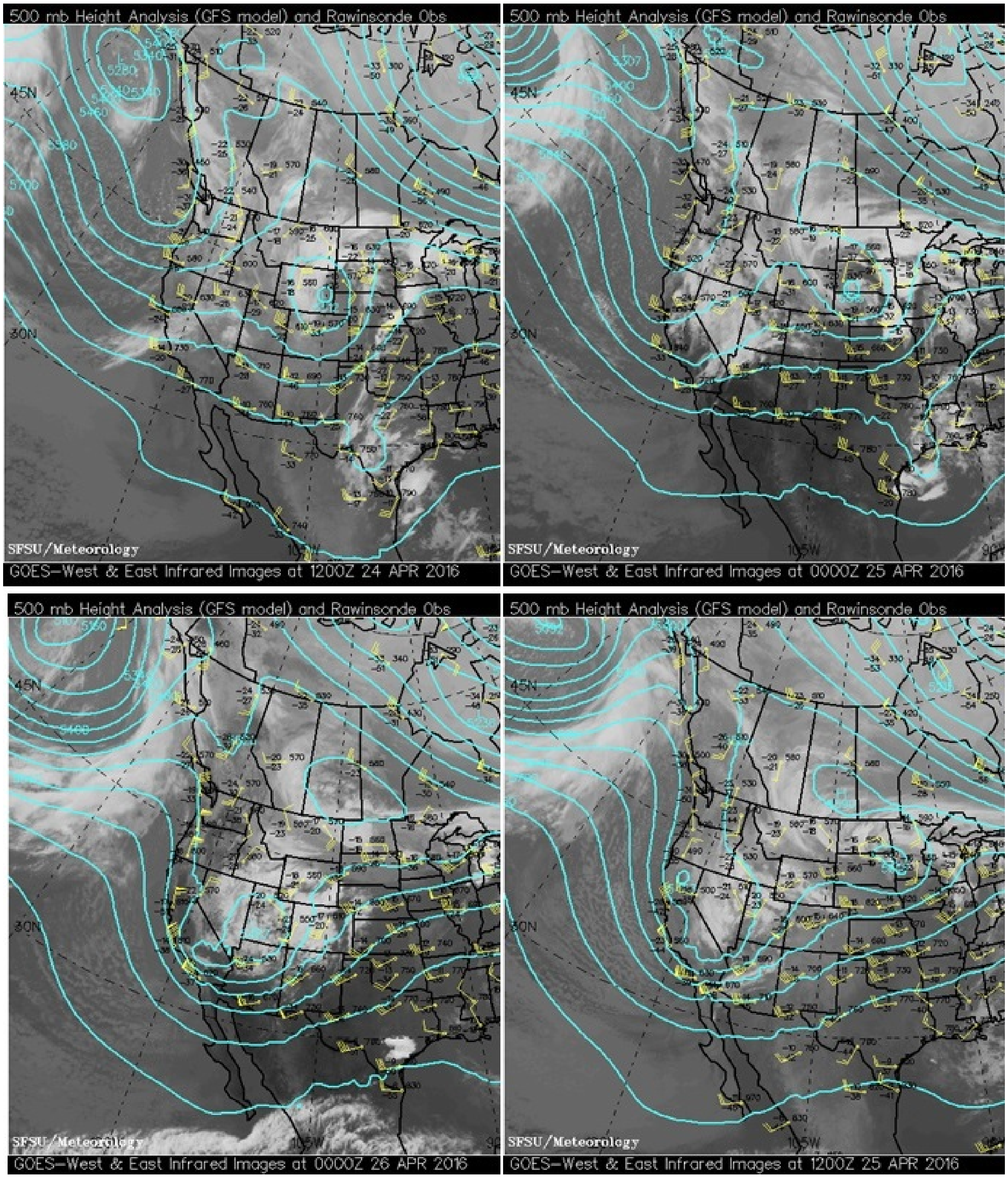


Fig 2-17: A quad of GOES E-W infrared satellite images showing the trough off the West Coast and the strengthening of the low through April 25, 2016. Clockwise from top left: 0400 PST; 1600 PST April 24, 2016; Bottom from left 0400 PST; 1600 PST April 25, 2016. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server

FIGURE 2-18
SURFACE GRADIENT TIGHTENS

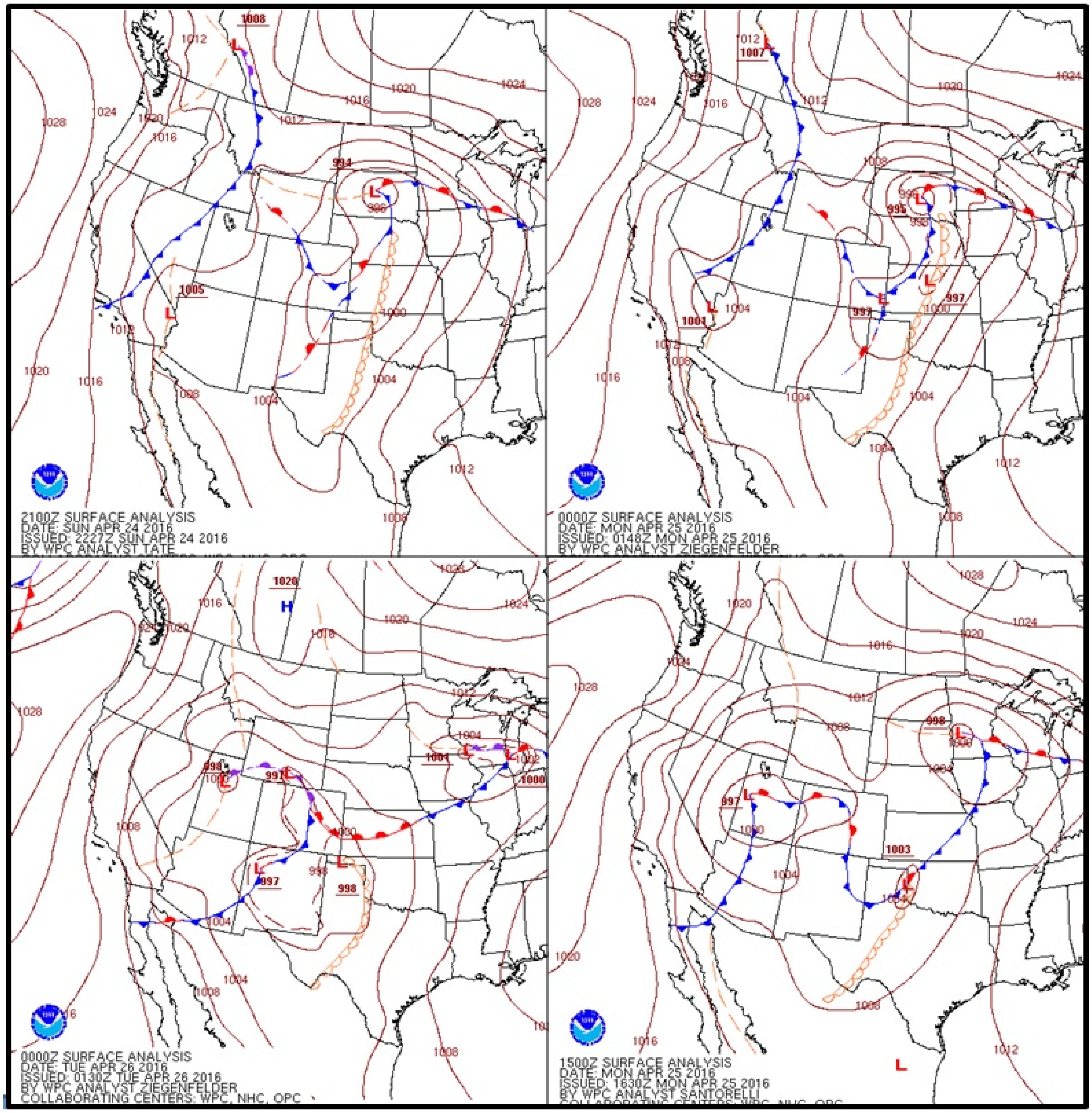


Fig 2-18: The movement of the upper level low into the region strengthened a surface low with an associated cold front. The tightening gradient brought gusty surface winds across southeastern California. The quad of surface analysis maps illustrates the modest tightening of the surface gradient April 24, 2016 through April 25, 2016 that was responsible for the gusty winds across southeastern California and Imperial County. Clockwise, from top left: 1300 PST; 1600 PST April 24, 2016. Bottom from left 0700 PST; 1600 PST April 25, 2016. Gusty winds began with this new system in the afternoon of April 24, 2016 continuing through April 25, 2016. Source: NWS Weather Prediction Center Surface Analysis Archive

FIGURE 2-19
SURFACE GRADIENT REMAINS PACKED

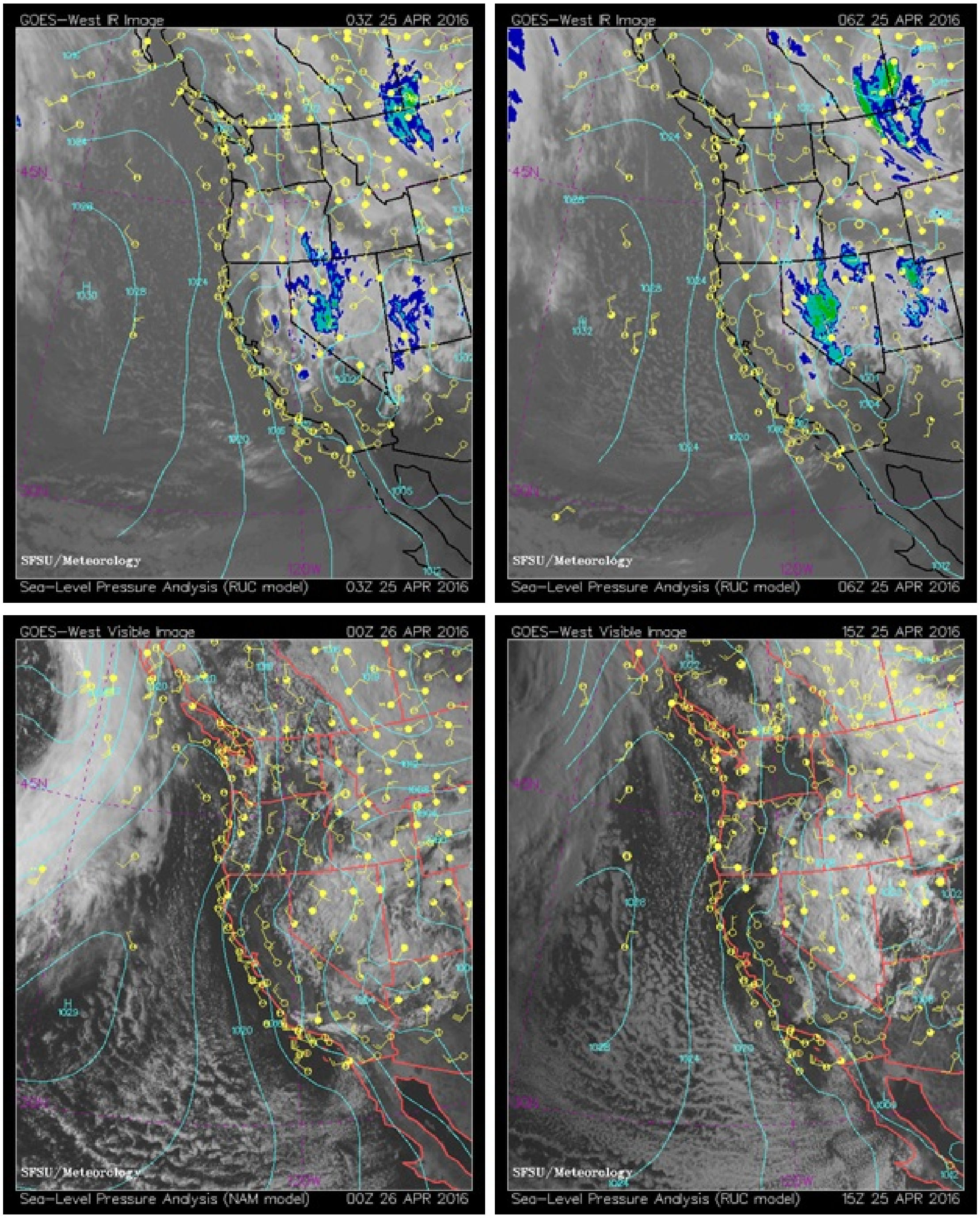


Fig 2-19: A quad of GOES-W visible (left) and infrared (right) satellite images. From left to right, the top pair captured at 1900 PST and 2200 PST on April 24, 2016 and the bottom pair captured at 0700 PST and 1600 PST on April 25, 2016 all during the period of high winds. For example, the 1900 PST image depicts wind barbs of at least 28.3 mph. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server

As mentioned above, the Pacific weather system that moved through the region on April 24, 2016 and April 25, 2016 was one of a series of systems that began as early as April 21, 2016. The San Diego NWS office issued several daily Area Forecasts and Urgent Weather messages that contained wind advisories for the mountains and deserts. On Saturday April 23, 2016 at 3:56am PST the San Diego NWS issued an expiration to the previously issued wind advisories only to reissue an Urgent Weather message containing a wind advisory for the Coachella Valley, San Diego County deserts and mountains effective through Monday, April 25, 2016. The first local storm report was issued by the San Diego NWS at 5:47pm Sunday, April 24, 2016, indicating that the Palm Springs Airport (KPSP) reported 45mph. By contrast, the Phoenix NWS office issued its first Urgent Weather message with wind advisory for Imperial County at 2:52am PST Sunday, April 24, 2016. All wind advisories issued were effective through Monday, April 25, 2016. Finally, at 9:00pm PST the San Diego NWS office issued the highest observed wind gusts as a Public Information Statement. The Public Information Statement, found in **Appendix A**, disclosed top wind gusts for the last 48 hours, i.e. Borrego Springs 54mph at 3:10pm PST April 25, 2016.

Figure 2-20 depicts the ramp up analysis or key points leading to the event on April 24, 2016. As the prior system began to wind down on Saturday, April 23, 2016 through Saturday, April 24, 2016 winds remained generally light and variable up through midday as measured at Imperial County Airport (KIPL) and El Centro NAF (KNJK). Starting early afternoon winds began to ramp up accompanied by strong gusts. By evening and into the night winds reached over 30 mph and gusts reached 45 mph. KNJK reported nine hours and KIPL reported three hours of winds at or above the 25 mph wind threshold. Upstream sites like Mountain Springs Grade on the desert slopes reported multiple hours of winds above the 25 mph threshold and gusts reaching 44 mph. Hourly PM_{10} concentrations at Brawley and Westmorland began to spike by mid-afternoon and peaked during the evening.

FIGURE 2-20
RAMP UP ANALYSIS APRIL 24, 2016

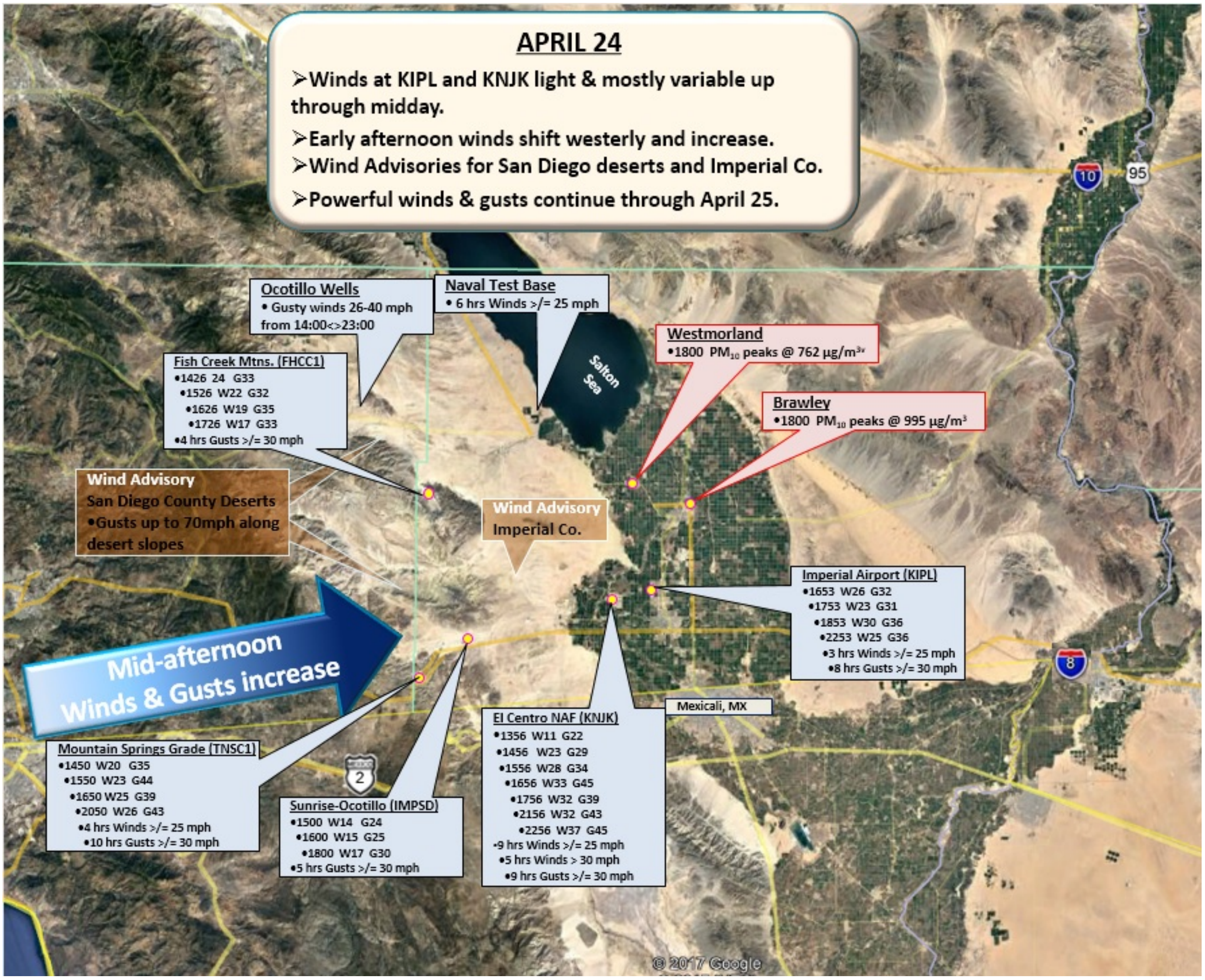


Fig 2-20: Winds began to ramp up early afternoon and increased as powerful gusts swept across Imperial County entraining windblown fugitive dust affecting air quality in Imperial County. Both the Brawley and Westmorland monitors measured an exceedance of the NAAQS. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Winds and gusts continued to remain strong on April 25, 2016 (**Figure 2-21**). They became strongest during the mid-afternoon. Two upstream sites measured gusts of at least 50 mph with numerous other sites measuring winds at or above the 25 mph wind threshold. Transported windblown dust by the winds downstream into Imperial County where it caused four out of five monitors to measure an exceedance. Although elevated the El Centro monitor did not measure an exceedance.

FIGURE 2-21
RAMP UP ANALYSIS APRIL 25, 2016

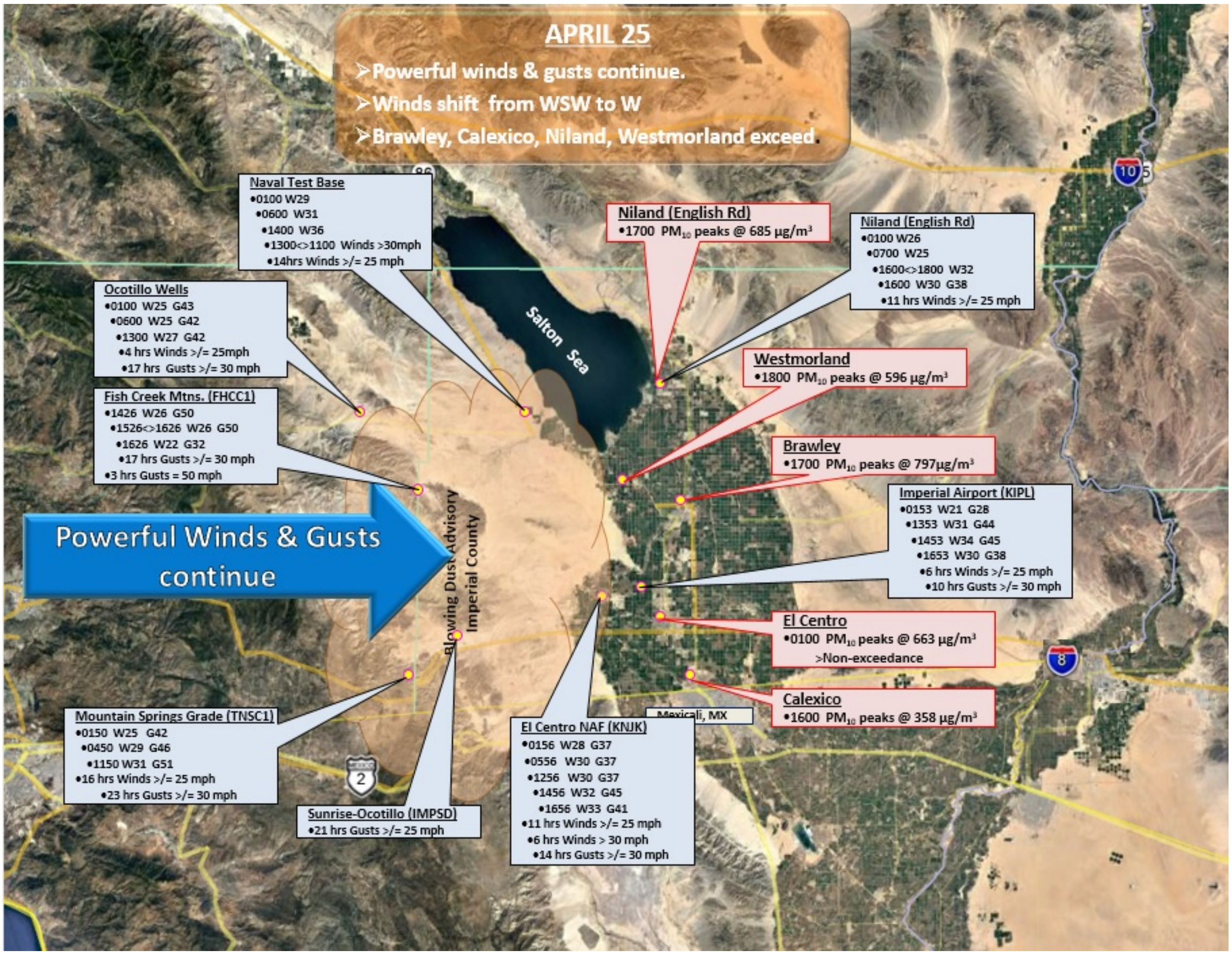


Fig 2-21: The strong winds and gusts on April 24, 2016 carried over into much of April 25, 2016. Winds shifted from WSW to a westerly direction April 25, 2016. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Table 2-2 has a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali, Mexico. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON APRIL 24, 2016 AND APRIL 25, 2016

Station Monitor Airport Meteorological Data	Day	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed				
							Brly	CX	EC	Nlnd	Wstmd
IMPERIAL COUNTY											
Imperial Airport (KIPL)	24	30	260	1853	36	18:53	995	152	75	349	995
	25	34	260	1453	45	14:53	421	208	229	196	263
Naval Air Facility (KNJK)	24	37	250	2256	45	16:56/22:56	332	41	48	76	57
	25	32	250	1356	45	14:56	270	109	317	135	202
Calexico (Ethel St)	24	14.7	278	2000	-	-	672	333	88	480	150
	25	17.8	284	1900	-	-	612	139	105	227	86
El Centro (9th Street)	24	16.6	248	2300	-	-	179	100	317	168	116
	25	19.6	254	1400	-	-	421	208	229	196	263
Niland (English Rd)	24	20.7	259	2200	-	-	332	41	48	76	57
	25	32.4	260	1700	-	-	797	330	162	685	567
Westmorland	24	12.9	238	1700	-	-	708	238	98	582	797
	25	21.1	275	1800	-	-	723	157	57	596	596
RIVERSIDE COUNTY											
Blythe Airport (KBLH)	24	30	240	1852	38	18:52	-	152	75	349	995
	25	30	230	1752	38	17:52	797	330	162	685	567
Palm Springs Airport (KPSP)	24	22	310	2253	34	19:53	332	41	48	76	57
	25	25	230	1553	41	9:53	431	200	-	516	423
Jacqueline Cochran Regional Airport (KTRM) - Thermal	24	22	330	1852	29	16:52	995	152	349	349	995
	25	28	320	1752	41	17:52	797	330	162	685	567
ARIZONA - YUMA											
Yuma MCAS (KNYL)*MST	24	22	180	1857	22	15:57	995	152	349	349	995
	25	26	280	2057	34	20:57	198	37	32	30	33
MEXICALI - MEXICO											
Mexicali Int. Airport (MXL)	24	18.4	280	2147	-	-	356	65	52	151	139
	25	28.7	250	1743	-	-	797	330	162	685	567

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[5] depicted in **Figure 2-22**, indicates the path of the airflow six hours prior

[5] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

to reaching the Brawley (green icon) and Westmorland (red icon) monitoring stations at 1800 PST, hourly peak concentrations for April 24, 2016. The back trajectory NOAA Air Resources Laboratory HYSPLIT model, depicted in **Figures 2-23** and **2-24** indicate the path of the airflow 12 hours prior to reaching all the air quality monitoring stations on April 25, 2016. The model illustrates the pronounced shift in wind direction to the west instead of a southwest direction the day before.

The trajectories illustrate a typical scenario when west winds (airflow) funnel through mountain passes, increasing in speed, down the desert slopes of San Diego County onto the valley floor. Strong westerly winds typically blow through these mountain passes and desert slopes entraining PM_{10} across the desert and agricultural lands within Imperial County. It is of some worth to point out that modeled winds can differ from local conditions. Data used in the HYSPLIT model, integrated every three hours, has a horizontal resolution of 12 km. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-22
NOAA HYSPLIT MODEL APRIL 24, 2016

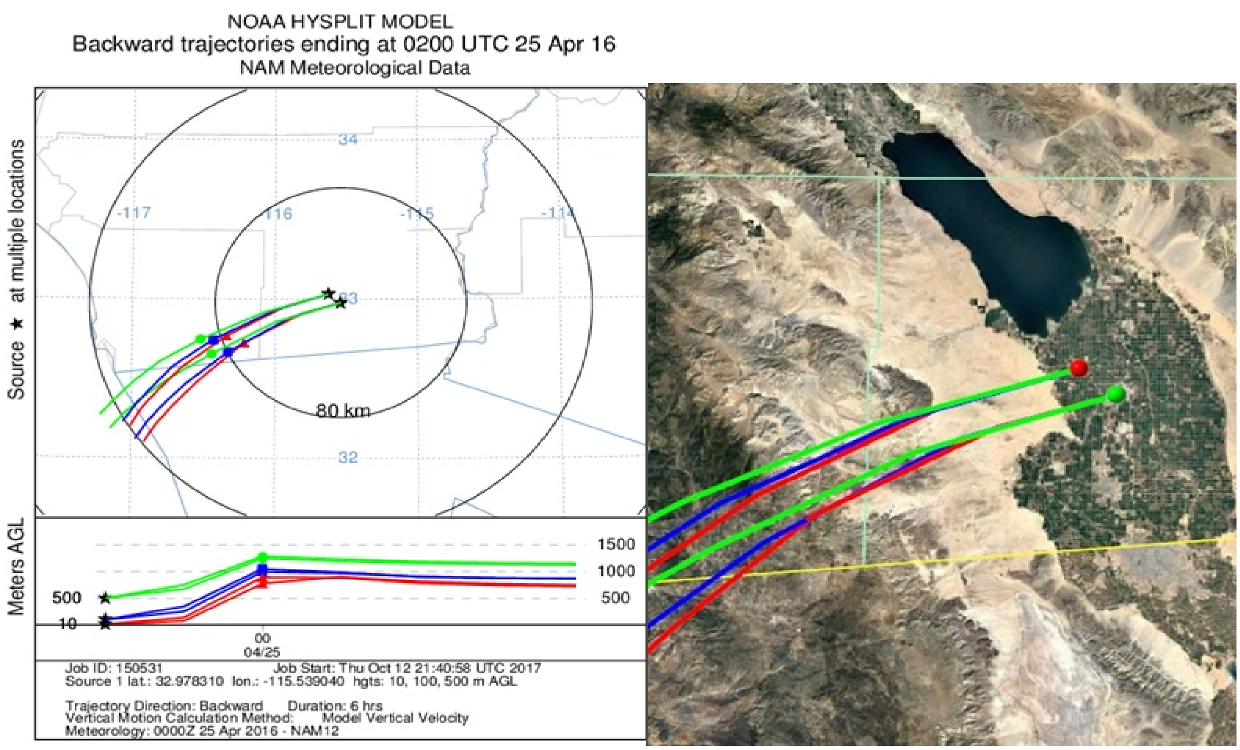


Fig 2-22: A 6-hour back trajectory ending at 1800 PST. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-23
NOAA HYSPLIT MODEL APRIL 25, 2016

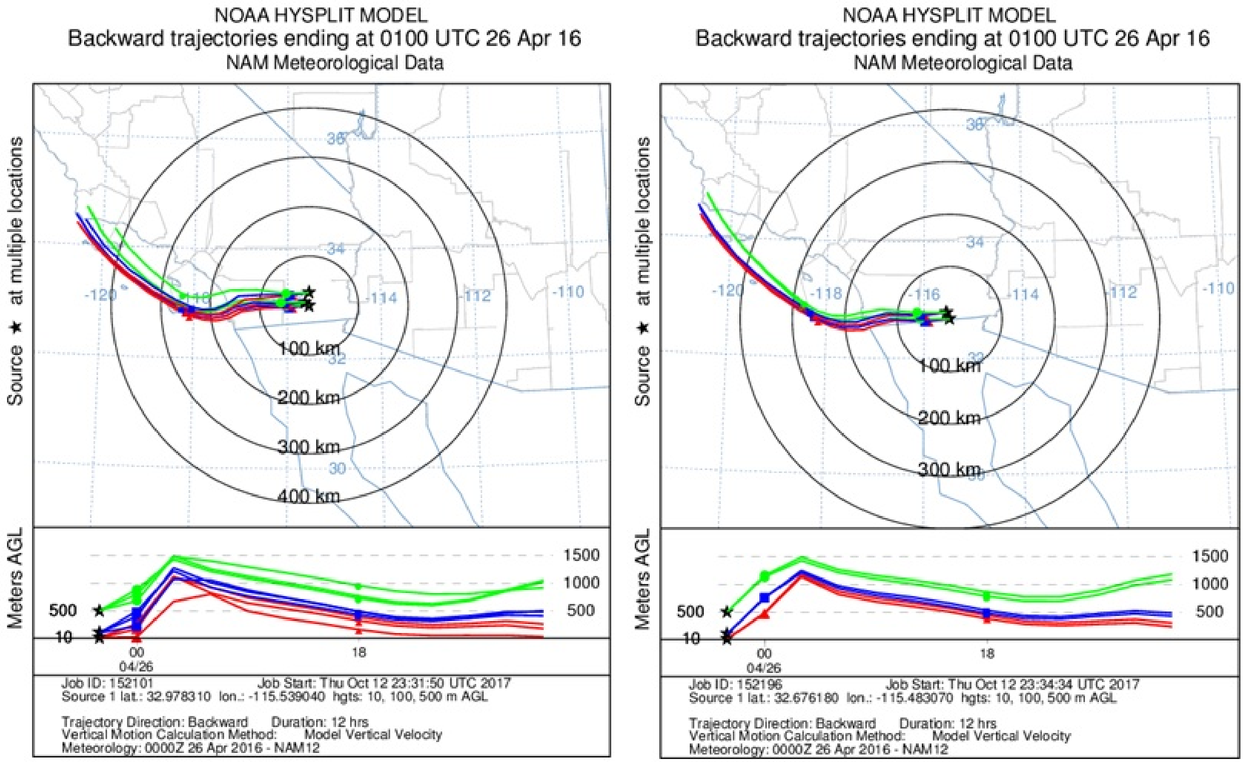


Fig 2-23: A 12-hour back trajectory ending at 1700 PST. Calexico reached peak hourly concentrations at 1600 PST; Brawley and Niland 1700 PST; Westmorland 1800 PST. El Centro, which was just under the exceedance threshold, peaked at 0100 PST. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-24
NOAA HYSPLIT MODEL WITH BASE MAP APRIL 25, 2016

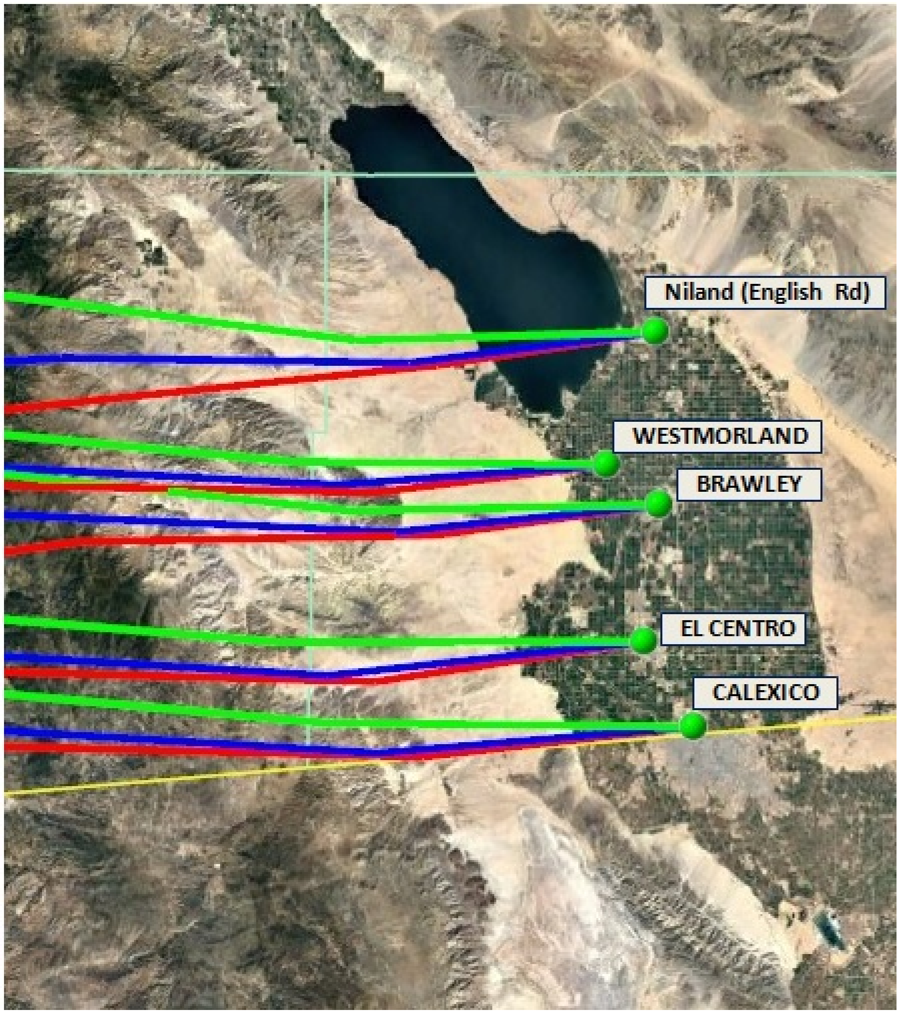


Fig 2-24: This is the base map for **Figure 2-23**. A 12-hour back trajectory ending at 1700 PST. Calexico reach peak hourly concentrations at 1600 PST; Brawley and Niland 1700 PST; Westmorland 1800 PST. El Centro, which was just under the exceedance threshold, peaked at 0100 PST. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-25 and 2-26 illustrate the elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties for a total of four days, April 23, 2016 through April 25, 2016. Elevated emissions entrained into Imperial County affected the Brawley, Calexico, El Centro, Niland, and Westmorland monitors when gusty west winds, associated with the passage of a low-pressure system and cold front moved across southern California and into Imperial County on April 24, 2016 and April 25, 2016. The Brawley, Calexico, Niland, and Westmorland monitors measured the highest elevated concentrations during the afternoon hours on April 24, 2016 and remained elevated through April 25, 2016. Unlike the other air monitoring stations the El Centro monitor measured early morning hours and intermittent afternoon hours of elevated concentrations April 25, 2016. The timing of elevated concentrations is coincident with measured wind speeds and gusts above the 25mph threshold.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[6] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the April 24, 2016 and April 25, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event

FIGURE 2-25
96 HOUR WIND SPEEDS AT VARIOUS SITES

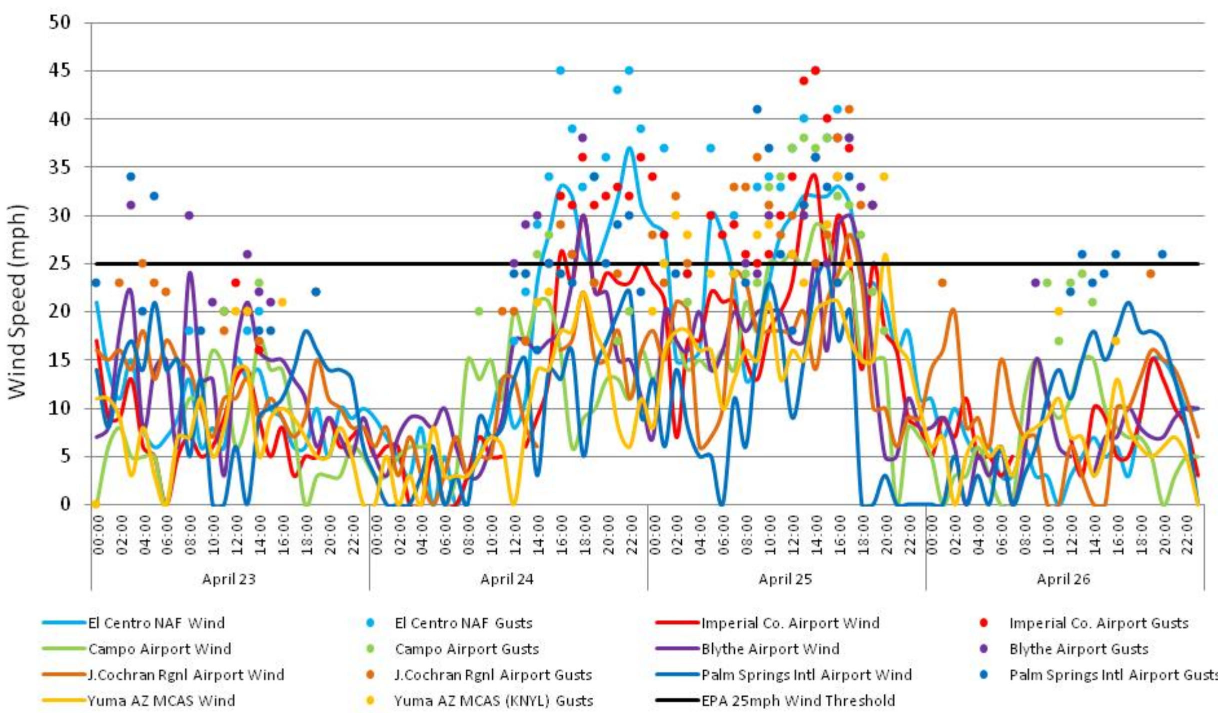


Fig 2-25: Is the graphical representation of the 96 hour measured winds speeds and gusts at various sites including regional airfields in California and Arizona. The graph illustrates the significant number of hours where measured wind speeds and wind gusts where above 25 mph. It emphasizes that this was a regional event. Wind Data from the NCEI's QCLCD system

[6] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-26
96 HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

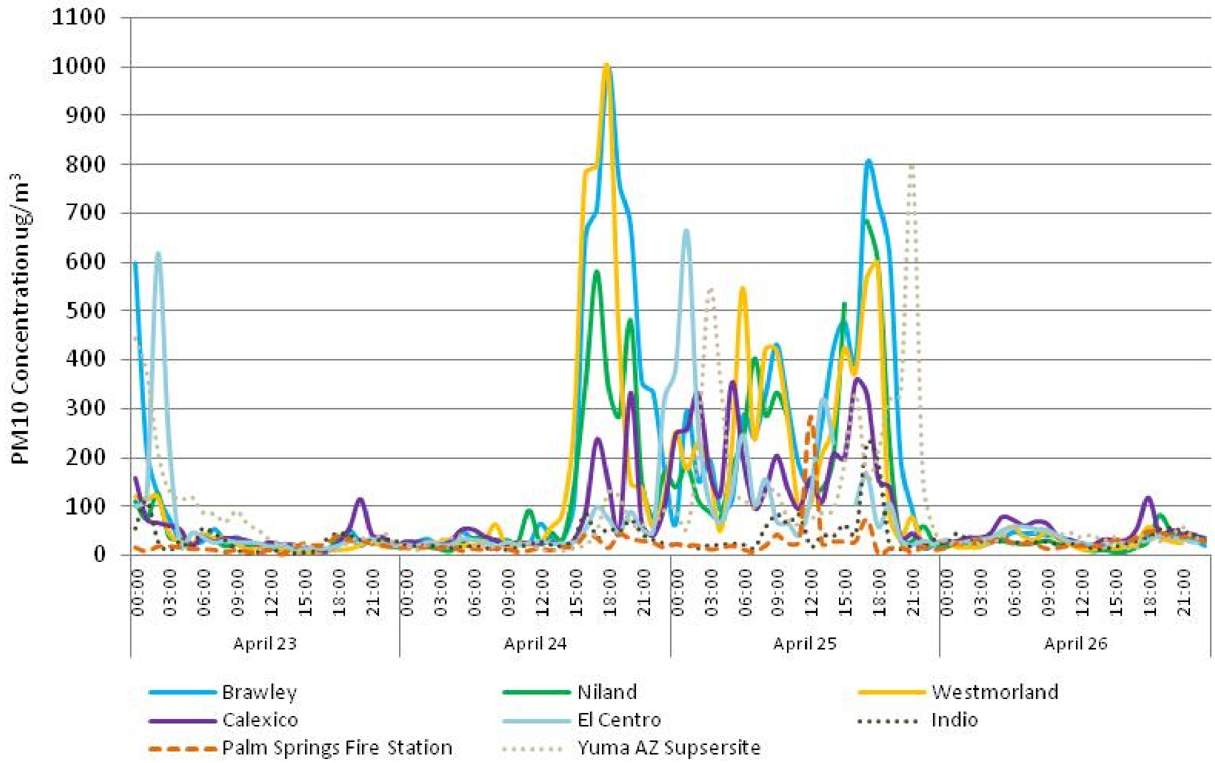


Fig 2-26: Is the graphical representation of the 96 hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at all sites on April 24, 2016 and April 25, 2016 demonstrate the regional impact of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley, Calexico, Niland, and Westmorland monitors on April 24, 2016 and April 25, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the April 24, 2016 and April 25, 2016 high wind event and the exceedance measured at the Brawley, Calexico, Niland, and Westmorland monitors.

Figures 3-1 through 3-8 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley, Calexico, Niland, and Westmorland stations for the period of January 1, 2010 through April 25, 2016. Note that prior to 2013, BAM data was not FEM therefore not reported into AQS.[7] In order to properly establish the variability of the event as it occurred on April 24, 2016 and April 25, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and April 25, 2016 were compiled and plotted as a time series. All six figures illustrate that the exceedance, which occurred on April 24, 2016 and April 25, 2016 were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

[7] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

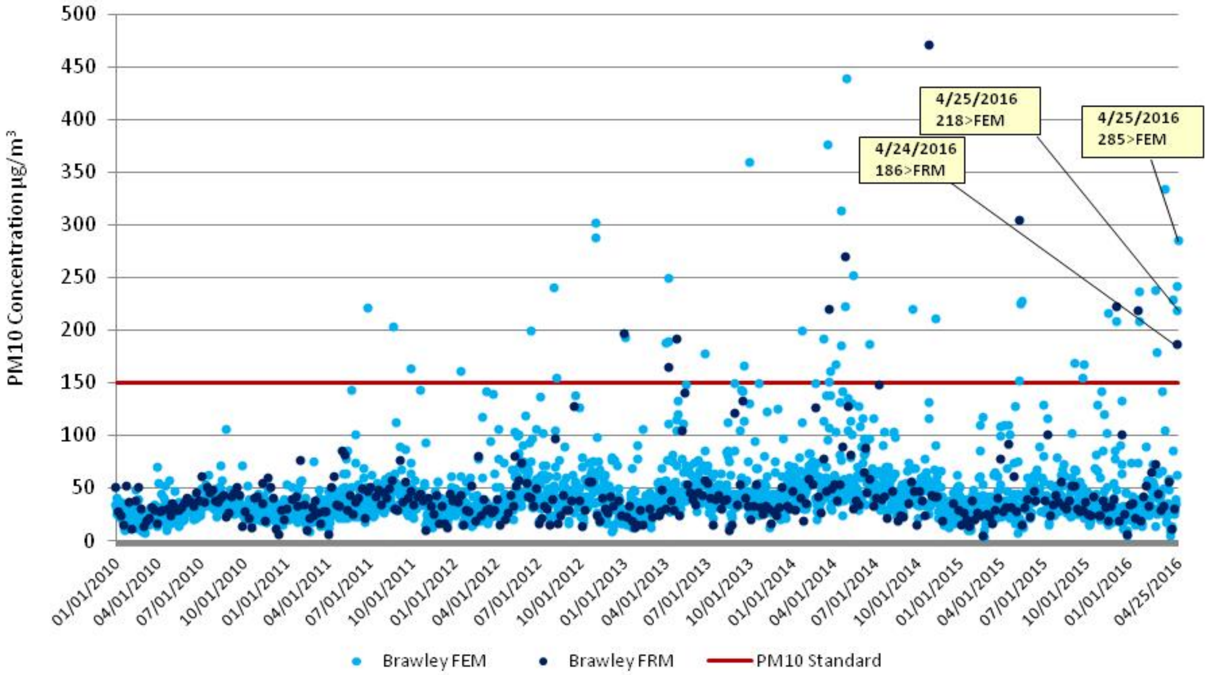


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 186 µg/m^3 and 218 µg/m^3 on April 24, 2016 and 285 µg/m^3 on April 25, 2016 by the Brawley monitor were outside the normal historical concentrations when compared to similar days and non-event days

FIGURE 3-2
CALEXICO HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

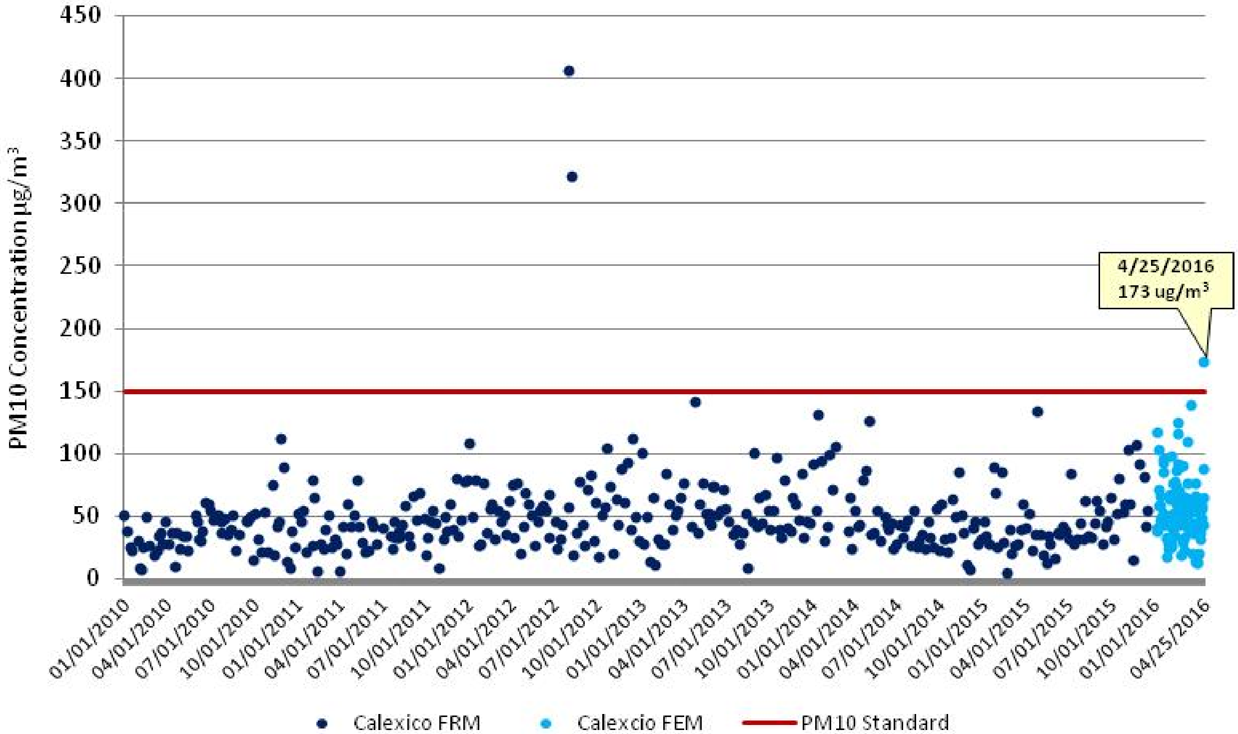


Fig 3-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 173 µg/m^3 by the Calexico monitor was outside the normal historical concentrations when compared to similar days and non-event days

FIGURE 3-3
NILAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

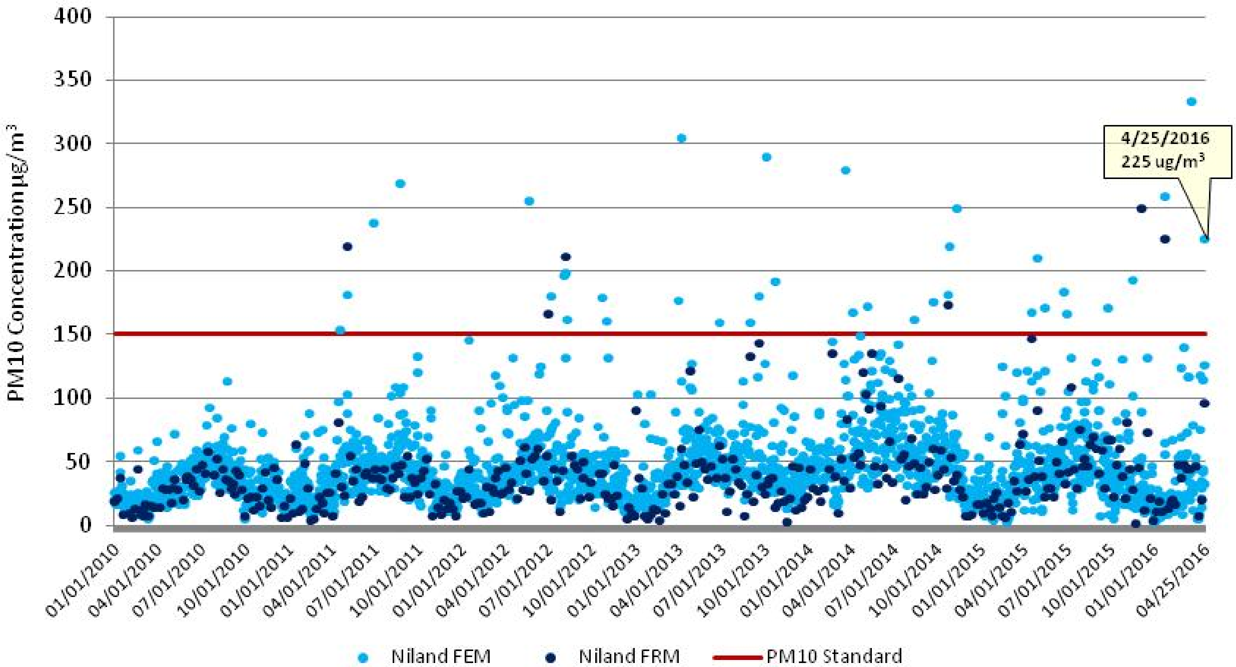


Fig 3-3: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 225 µg/m^3 by the Niland monitor was outside the normal historical concentrations when compared to similar days and non-event days

FIGURE 3-4
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

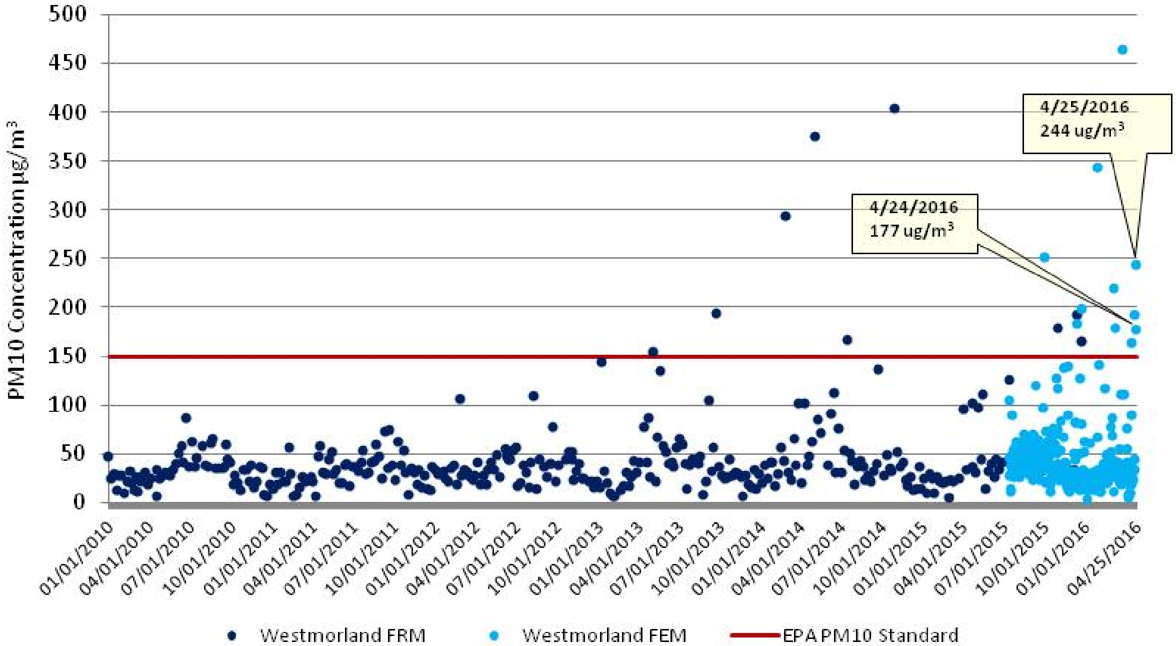
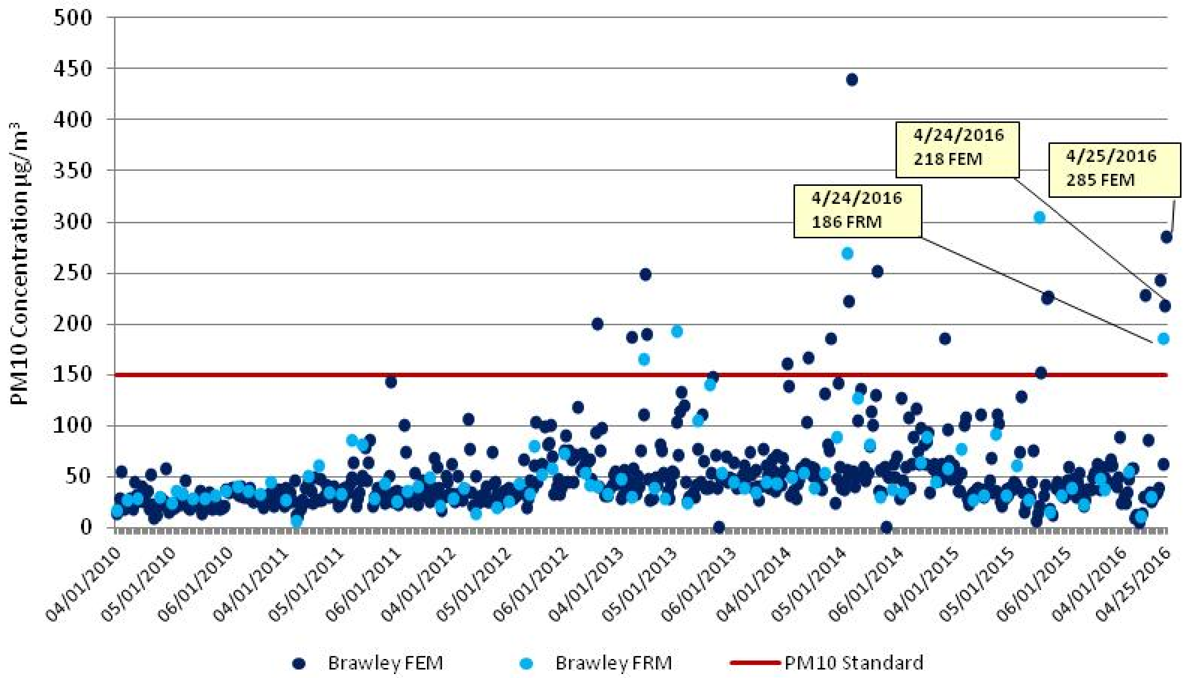


Fig 3-4: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 177 µg/m^3 and 244 µg/m^3 by the Westmorland monitor were outside the normal historical concentrations when compared to similar days and non-event days

The time series, **Figures 3-1 through 3-4** for Brawley, Calexico, Niland, and Westmorland included 2,307 sampling days (January 1, 2010 through April 25, 2016). During this period the Brawley station (**Figure 3-1**) measured 2,672 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and April 25, 2016.

Overall, the time series illustrates that of the 2,672 credible samples measured within the 2,307 sampling days there were 47 exceedance days, which is a 1.8% occurrence rate. Calexico (**Figure 3-2**) measured 462 credible samples (FEM sampling commenced on January 2016) with three measured exceedance days which equates to 0.6% of all samples. Niland (**Figure 3-3**) measured 2,670 credible samples with 40 measured exceedance days which equates to 1.5% of all samples. Westmorland (**Figure 3-4**) measured 643 credible samples (FEM sampling began July 2015) with 18 measured exceedance days which equates to 2.8% of all samples. No exceedances of the standard occurred during 2010. As mentioned above, FEM BAM data was not regulatory from 2010 to 2012.

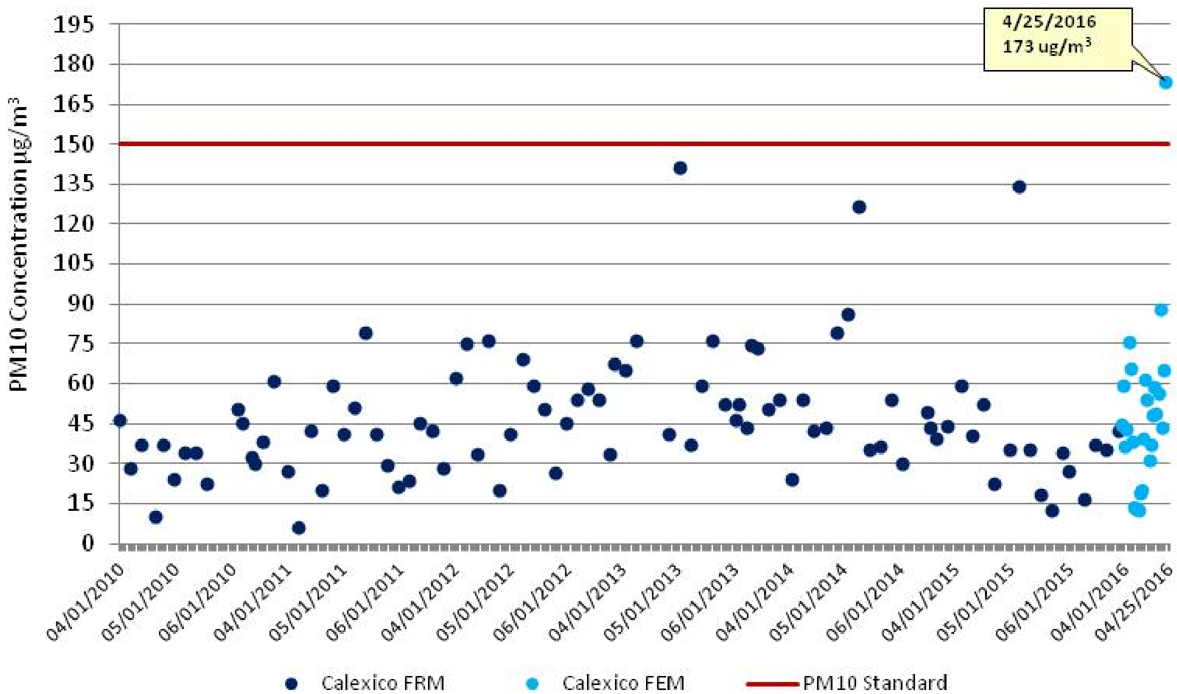
FIGURE 3-5
BRAWLEY SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 TO JUNE 30, 2016**



***Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 25, 2016**

Fig 3-5: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 186 µg/m^3 and 218 µg/m^3 on April 24, 2016 and 285 µg/m^3 on April 25, 2016 by the Brawley monitor were outside the normal seasonal concentrations when compared to event days and non-event days

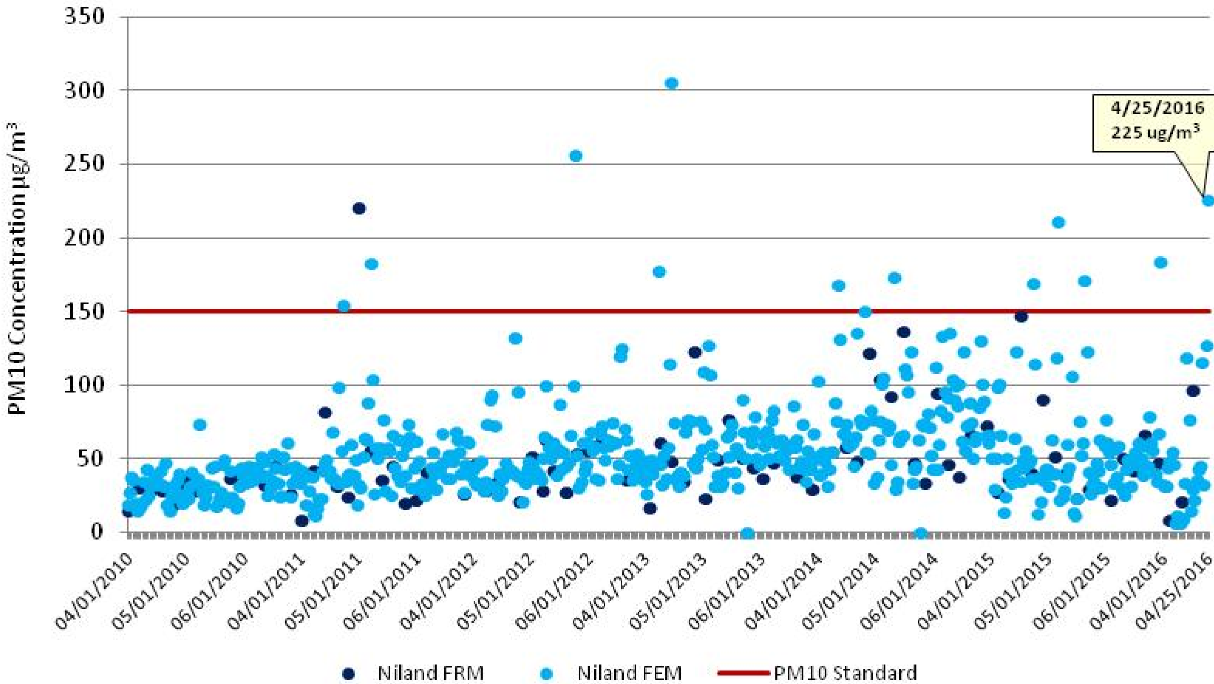
FIGURE 3-6
CALEXICO SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 TO JUNE 30, 2016**



***Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 25, 2016**

Fig 3-6: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 173 µg/m^3 by the Calexico monitor on April 25, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

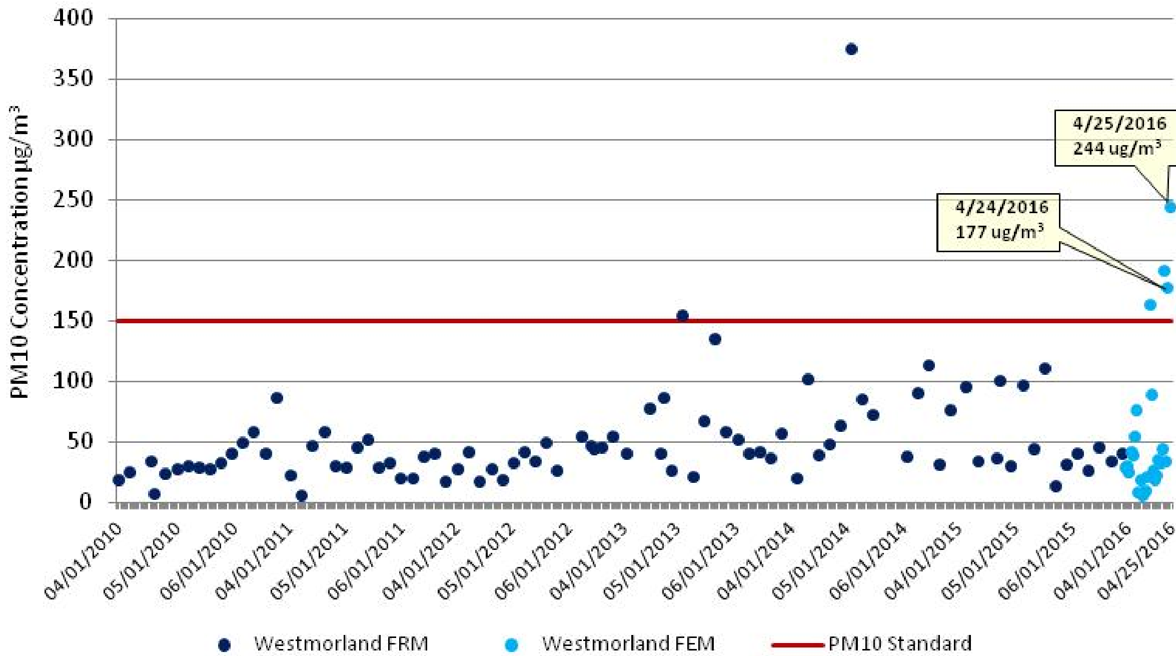
FIGURE 3-7
NILAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 TO JUNE 30, 2016**



***Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 25, 2016**

Fig 3-7: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 225 µg/m^3 by the Niland monitor on April 25, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

FIGURE 3-8
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 TO JUNE 30, 2016**



***Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 25, 2016**

Fig 3-8: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations of 177 µg/m^3 on April 24, 2016 and 244 µg/m^3 on April 25, 2016 by the Westmorland monitor were outside the normal seasonal concentrations when compared to event days and non-event days

Figures 3-5 through 3-8 display the seasonal fluctuations over 571 sampling days at the Brawley, Calexico, Niland, and Westmorland stations for months April through June of years 2010 through 2016. The seasonal sampling period for Brawley (**Figure 3-5**) had a total 663 credible samples with 20 exceedance days during the second quarter, which translates into 3% of all samples. The seasonal sampling period for Calexico (**Figure 3-6**) contains 116 credible samples with one exceedance day equating into 0.9% of all samples. The seasonal sampling period for Niland (**Figure 3-7**) measured 660 credible samples and 14 exceedance days during the historical second-quarter period. This equates to just 2.1% of all samples. The seasonal sampling period for Westmorland station (**Figure 3-8**)[8] contains 113 credible samples and six exceedance days, or 5.3% of all samples.

[8] FEM sampling at the Westmorland site began July 2015 therefore January is the only seasonal first-quarter data available.

FIGURE 3-9
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

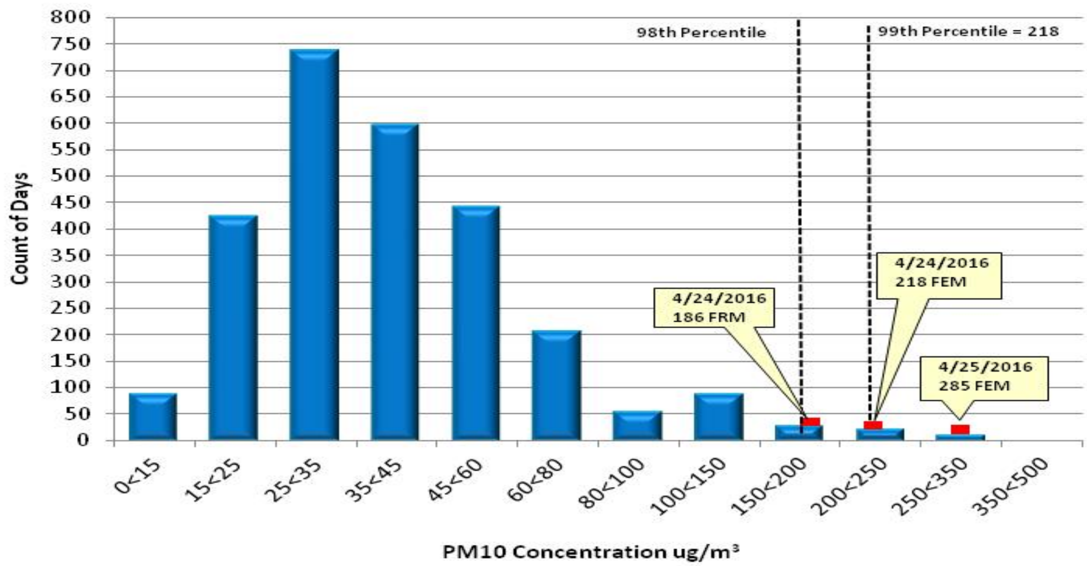


Fig 3-9: The 24-hr average PM_{10} concentration at the Brawley monitoring site demonstrates that the concentrations of 186 µg/m^3 was in excess of the 98th percentile, while the concentrations of 218 µg/m^3 and 285 µg/m^3 fell above the 99th percentile

FIGURE 3-10
CALEXICO HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 THROUGH APRIL 25, 2016

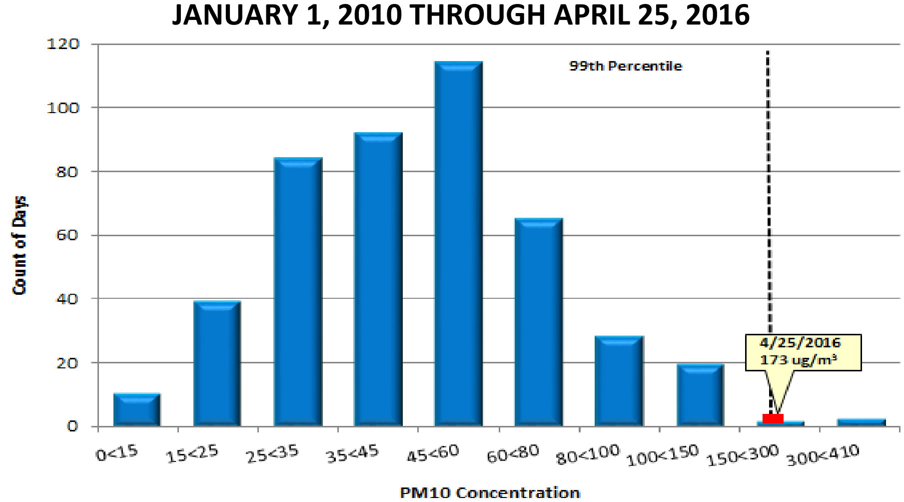


Fig 3-10: The 24-hr average PM_{10} concentration at the Calexico monitoring site demonstrates that the concentration of 173 µg/m^3 was in excess of the 99th percentile

FIGURE 3-11
NILAND HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

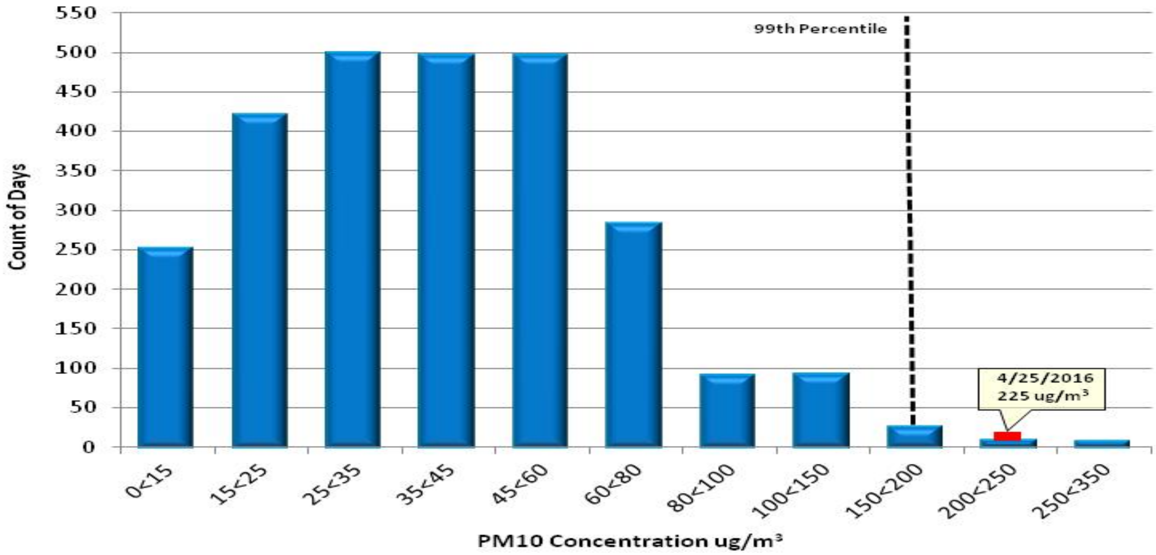


Fig 3-11: The 24-hr average PM_{10} concentration at the Niland monitoring site demonstrates that the April 25, 2016 event was in excess was above the 99th percentile

FIGURE 3-12
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 25, 2016

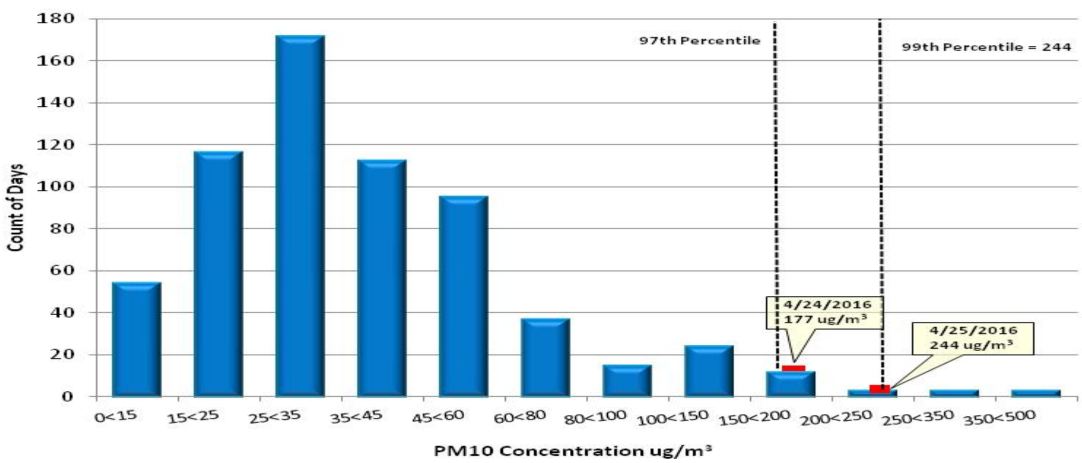


Fig 3-12: The 24-hr average PM_{10} concentration at the Westmorland monitoring site demonstrates that the concentration of 177 µg/m^3 on April 24, 2016 was in excess of the 97th percentile while the concentration of 244 µg/m^3 on April 25, 2016 was in excess of the 99th percentile

For the combined FRM and FEM data sets the annual historical and the seasonal historical PM_{10} concentrations of 186 µg/m^3, 218 µg/m^3, and 285 µg/m^3 for Brawley, 173 µg/m^3 for Calexico, 225 µg/m^3 for Niland, 177 µg/m^3 and 244 µg/m^3 for Westmorland the percentile ranking are all above the 99th rank. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for both the historical and seasonal patterns, the April 24, 2016 and April 25, 2016 measured exceedances are clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on April 24, 2016 and April 25, 2016 occurs infrequently. When comparing the measured PM_{10} levels on April 24, 2016 and April 25, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley, Calexico, Niland, and Westmorland monitoring sites were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the April 24, 2016 and April 25, 2016 natural event affected the concentrations levels at the Brawley, Calexico, Niland, and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on April 24, 2016 and April 25, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for April 24, 2016 and April 25, 2016. In addition, this April 24, 2016 and April 25, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley, Calexico, Niland, and Westmorland monitors on April 24, 2016 and April 25, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the April 24 and April 25, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25,

1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006, ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

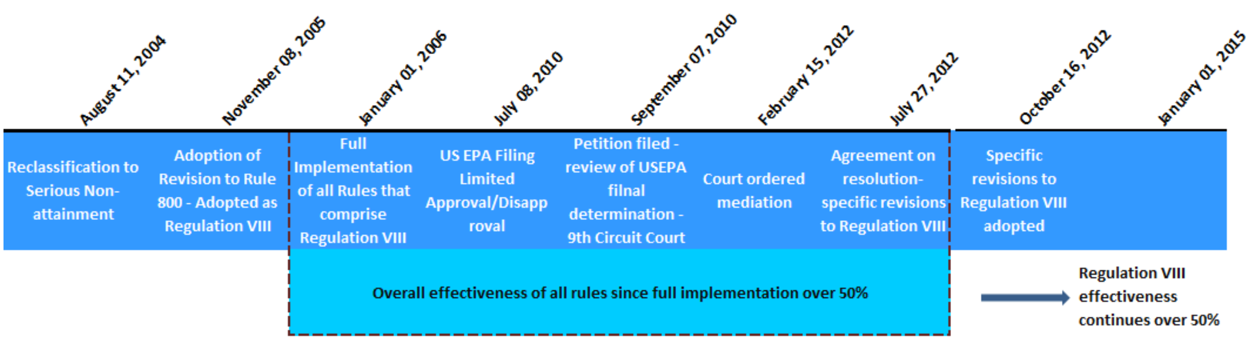


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII, which is comprised of seven fugitive dust rules, found below. The **Appendix D** contains the complete set of rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On April 24 and April 25, 2016 the ICAPCD declared a No Burn day **(Appendix A).** No complaints were filed for agricultural burning on April 24 and April 25, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A compiled query of the ICAPCD permit database was reviewed for active permitted sources throughout Imperial County and specifically around Brawley, Calexico, Niland and Westmorland during the April 24, 2016 and April 25, 2016 PM_{10} exceedances. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on April 24, 2016 and April 25, 2016, officially declared as No Burn days, related to agricultural burning, waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

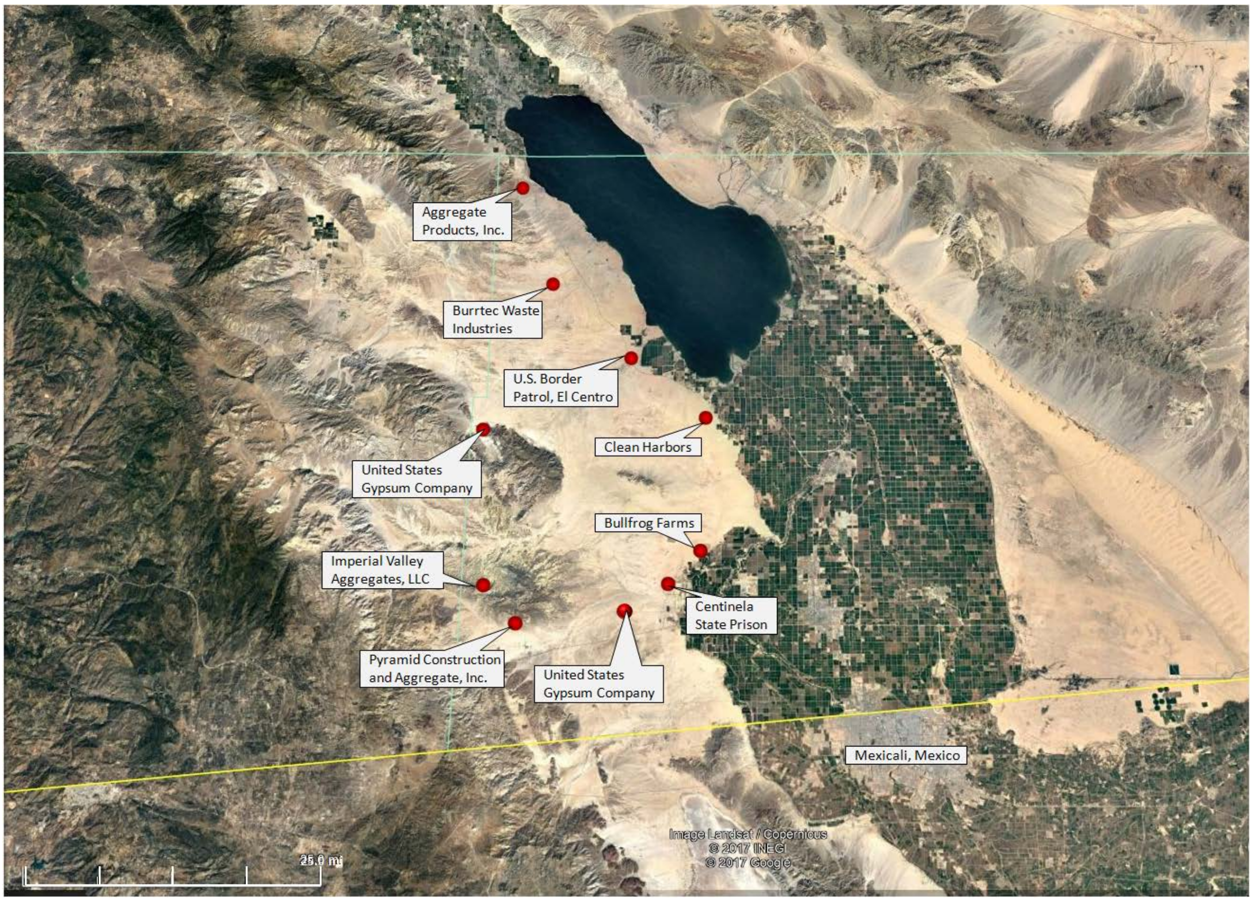


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley, Calexico, Niland and Westmorland monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

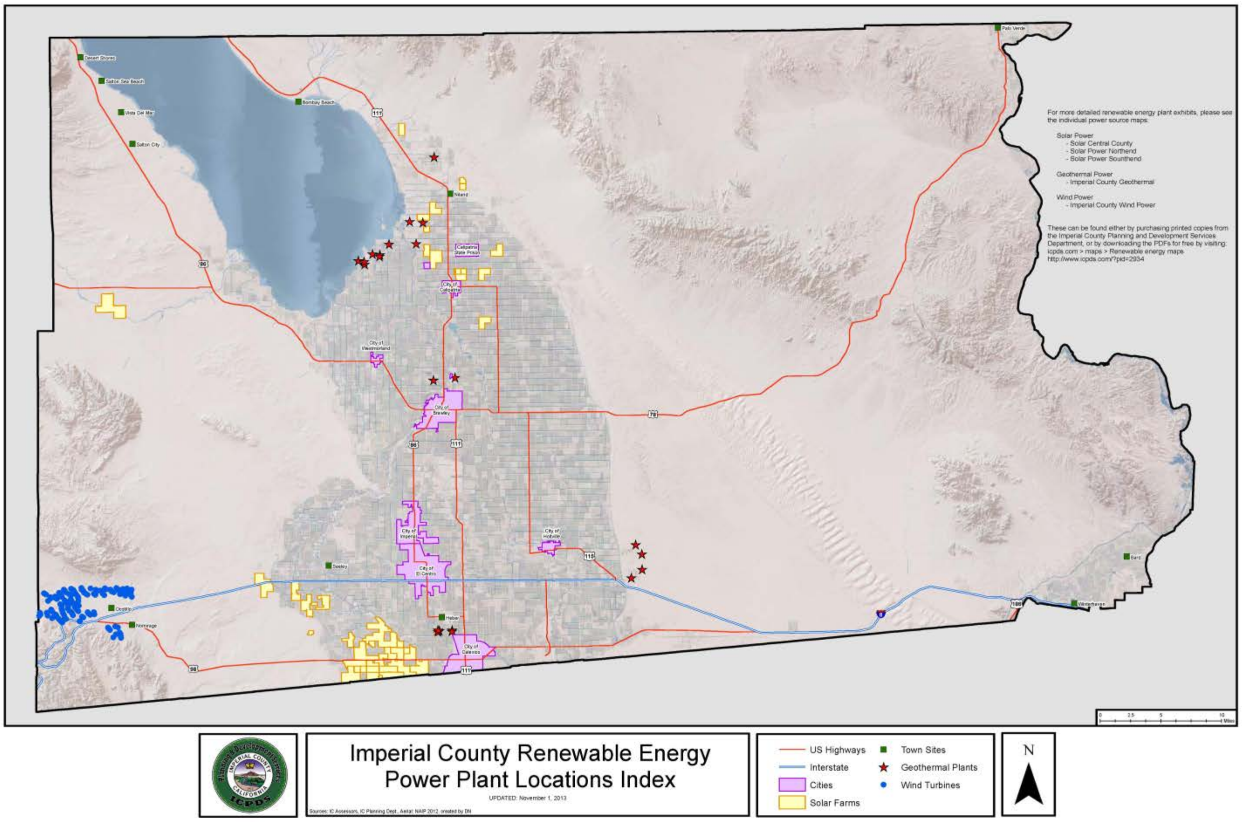


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

As mentioned above, early as April 19, 2016 the ICAPCD posted notices that a strong Pacific weather system would begin to move through the region and bring windy conditions into southern California April 24, 2016 and April 25, 2016. Similarly, both the San Diego and Phoenix National Weather Service (NWS) offices issued notices to the public explaining that a series of Pacific weather systems was moving into California. Unlike the Phoenix NWS office, the San Diego NWS office issued the earliest Urgent Weather Message with wind advisories April 21, 2016. The Phoenix NWS office did not begin to issue Urgent Weather Messages until the early morning hours of April 24, 2016.

The Phoenix NWS weather story and forecast issued on April 24, 2016 called for the strongest winds to be across southeastern California with winds and gusts of 40 to 50 mph expected. The San Diego NWS weather story forecast issued April 24, 2016 forecasted that the strongest winds would be across the mountains and desert slopes, with isolated gusts up to 70 mph along desert slopes west of Imperial Valley. Advisories warned of blowing dust and sand with conditions extending into Monday, April 25, 2016. The April 25, 2016 NWS Phoenix weather story forecast advised that strong winds would continue across southeastern California, along with the expectation of limited visibility due to blowing dust and sand. On April 25, 2016, the San Diego weather story forecast warned of structural damage in the deserts due to the high winds. Both San Diego and Phoenix NWS offices issued wind advisories for a wide area, including a blowing dust advisory for portions of Imperial County.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Similarly, other data from automated meteorological instruments were utilized that were upstream from the Brawley, Calexico, Niland and Westmorland monitors during the wind event. On April 24, 2016, the El Centro NAF (KNJK) measured nine hours of winds at or above 25 mph, five of which were above 30 mph. The Imperial County Airport (KIPL) measured three hours of winds at or above 25 mph, and eight hours of gusts at or above 30 mph. Upstream stations to the west had either winds above 25 mph or peak gusts at 40 mph. On April 25, 2016, the El Centro NAF (KNJK) measured 11 hours of winds at or above 25 mph, seven of which were at or above 30 mph. The Imperial County Airport (KIPL) measured six hours of winds above 25 mph, with 10 hours of gusts at or above 30 mph. Multiple stations measured winds at or above the 25 mph threshold. Finally, the Niland monitor measured 11 hours of winds at or above 25 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the April 24, 2016 and April 25, 2016 event wind speeds were at or above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong low pressure system and cold front that moved through southern California entrained particulate matter that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of Brawley, Westmorland, and Niland monitoring stations during the event were high enough (at or above 25 mph, with wind gusts of 45 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on April 24, 2016 and April 25, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The April 24, 2016 and April 25, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for April 24, 2016 and April 25, 2016 identified a strengthening surface low extending into southern Nevada that intensified through April 25, 2016. The tightening surface gradients produced a strong onshore flow from the southern California coast inland to southern Nevada. Gusty westerly winds reaching 37 mph with gusts to 45 mph swept through Imperial County.

Entrained windblown dust from natural areas, particularly from the desert areas west of the Brawley, Calexico, Niland and Westmorland monitors, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations. The satellite image, **Figure 5-1**, captured windblown dust drifting over Imperial County on April 25, 2016. The image was captured by the MODIS instrument[9] onboard the Terra satellite. Although, both the Terra and Aqua satellites made their pass on April 24, 2016 and April 25, 2016 before PM_{10} concentrations were at their highest for those days it supports the conditions that existed when the accumulation windblown dust from the passing of more than one system entrained dust into the air causing air quality to be affected.

FIGURE 5-1
BLOWING DUST OVER IMPERIAL COUNTY

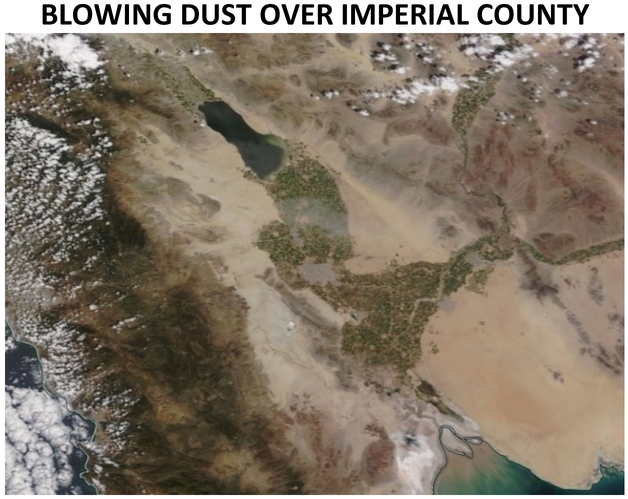


Fig 5-1: The MODIS instrument onboard the Terra satellite captured entrained fugitive emissions from more than one passing system into Imperial County at ~10:30 PST on April 25, 2016. Source: MODIS Today

[9] MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. MODIS Technical Specifications identify the Terra orbit at 10:30am and the Aqua at 1:30pm (Appendix A).

FIGURE 5-2
TIGHT GRADIENT ACROSS SOUTHEASTERN CALIFORNIA APRIL 24, 2016

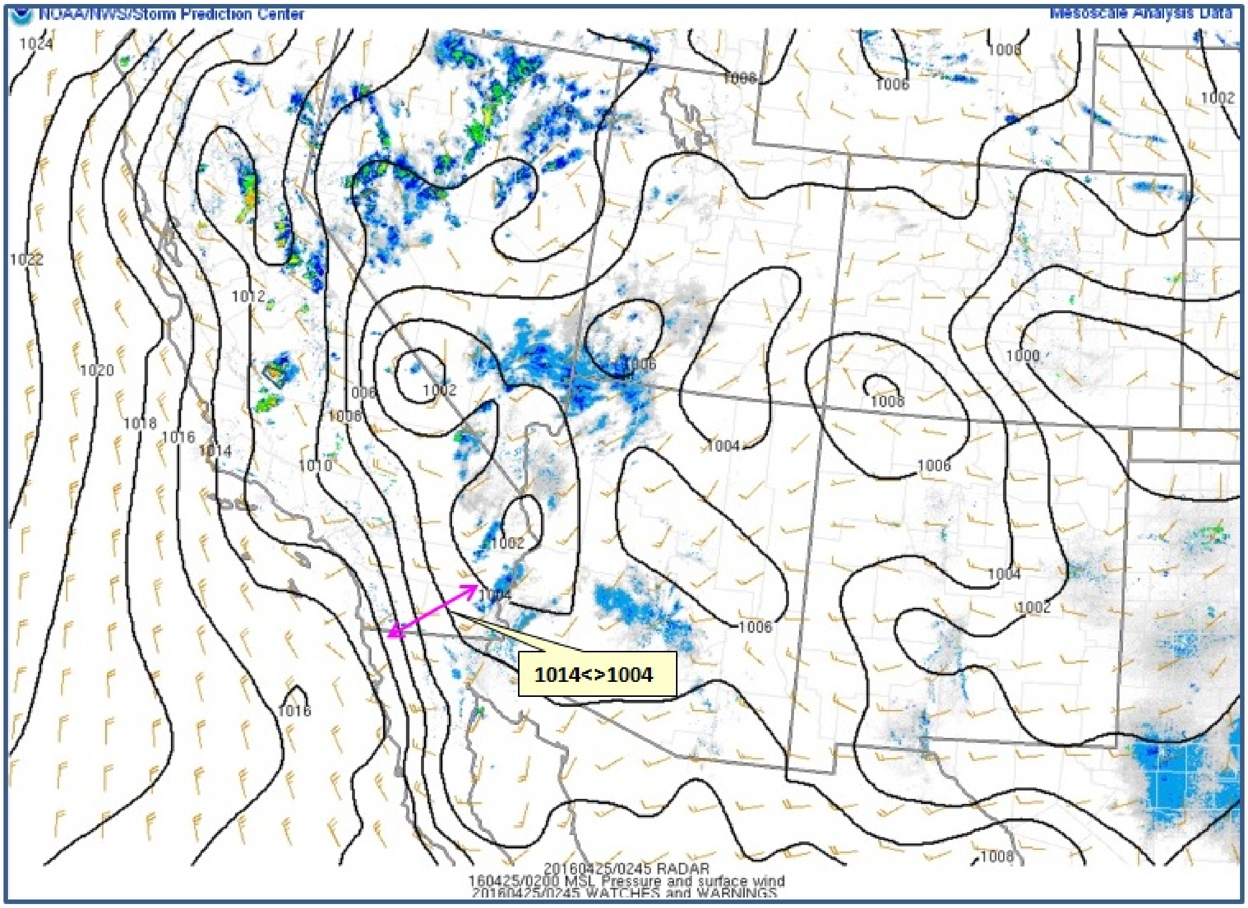


Fig 5-2: Surface analysis map showing the gradient significantly packed from the California coast to southern Nevada. A difference of about 10mb from the southern California coast to southern Nevada generated strong and long-lived winds across southeastern California and Imperial County in particular. This is image shows surface winds at 1800 PST on April 24, 2016 (radar is 1845). At 1756 El Centro NAF reported winds of 33 mph and gusts of 39 mph. Starting 1600 Brawley reported significant elevations of hourly PM10. Source: NOAA's SPC Mesoanalysis; http://www.spc.noaa.gov/exper/mesoanalysis/new/viewsector.php

FIGURE 5-3
TIGHT GRADIENT ACROSS SOUTHEASTERN CALIFORNIA APRIL 25, 2016

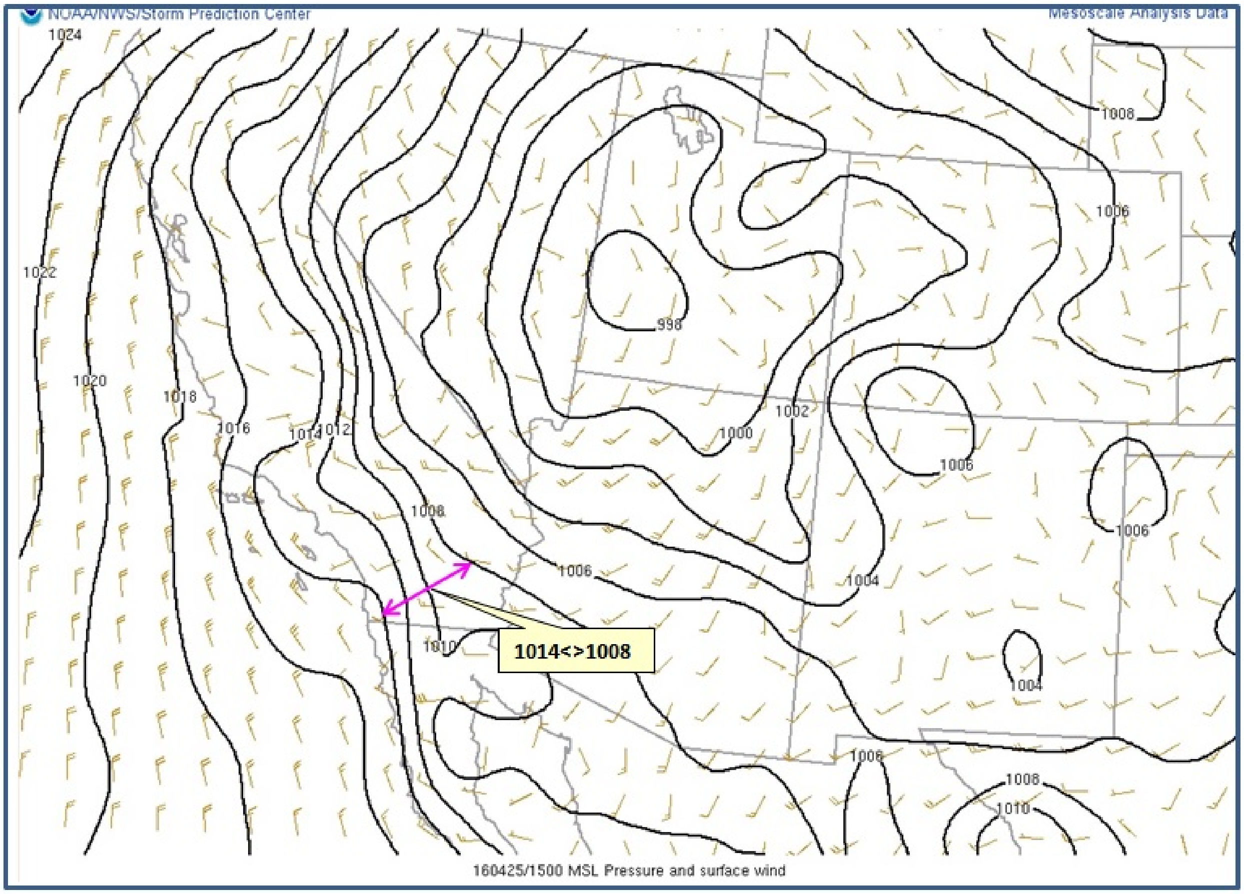


Fig 5-3: Surface height falls generated strong and long-lived winds across southeastern California and Imperial County in particular. A surface analysis map showing the gradient significantly packed from the California coast to southern Nevada at 0700 PST on April 25, 2016. A difference of about 8mb from the southern California coast to southern Nevada kept winds strong through most of April 25, 2016. This is image shows surface winds at 0700 PST on April 25, 2016. At 0656 El Centro NAF reported winds of 28 mph. By 0700 Brawley, Calexico, Niland, and Westmorland were showing elevated levels of PM10. Source: NOAA's SPC Mesoanalysis; http://www.spc.noaa.gov/exper/mesoanalysis/new/viewsector.php

Figure 5-4 through **Figure 5-7** are images of aerosols drifting over Imperial County captured by the MODIS instrument onboard the Terra and Aqua satellites. Warmer colors indicate increasing AOD thickness. **Figures 5-6** through **5-7** utilize the Deep Blue Angstrom exponent to measure AOD. This is useful in showing heavier aerosols that indicate dust. As seen from the images, there was a heavy layer of aerosols over the area April 24, 2016 and April 25, 2016.

FIGURE 5-4

TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY APRIL 24, 2016

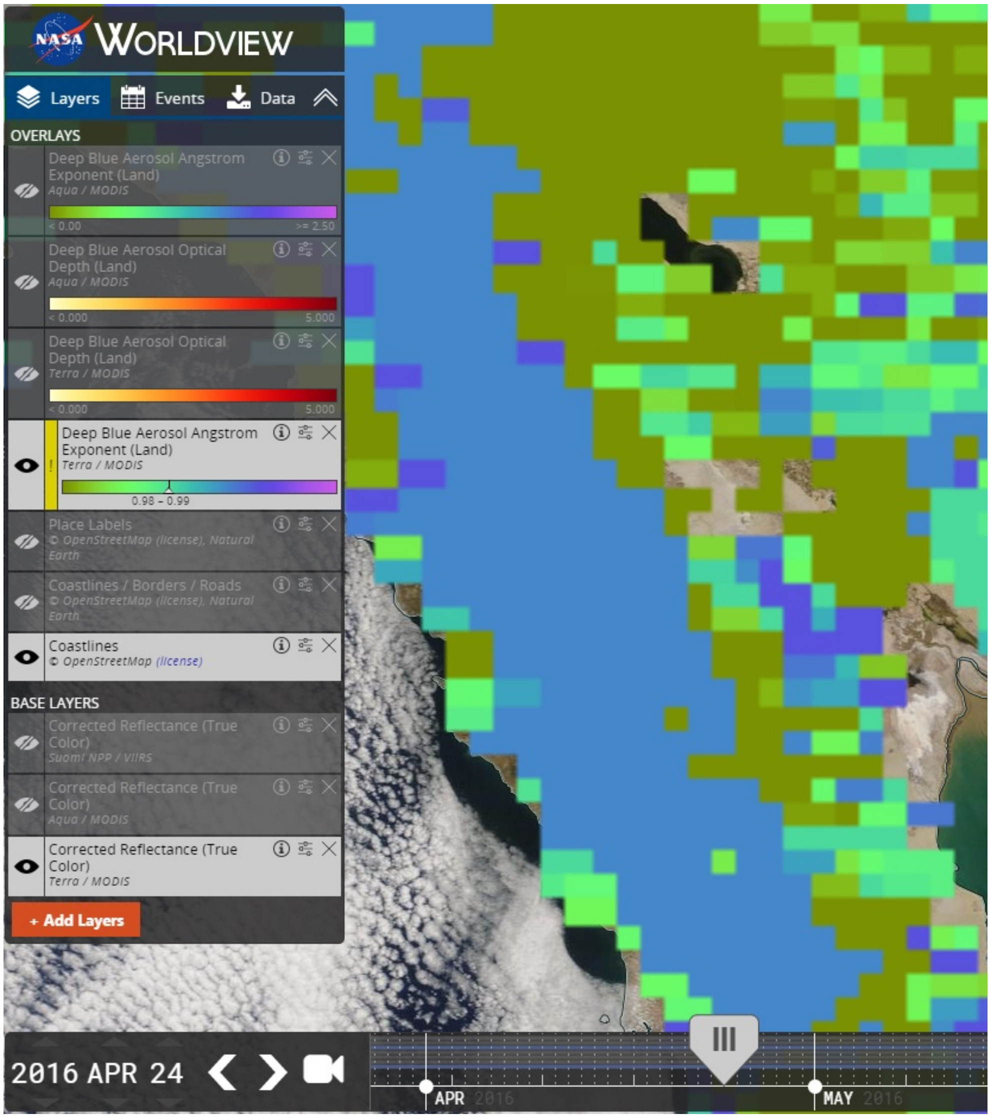


Fig 5-4: The MODIS instrument onboard the Terra satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~1030 PST on April 24, 2016. Green colors indicate thicker aerosols. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

FIGURE 5-5
AQUA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY APRIL 24, 2016

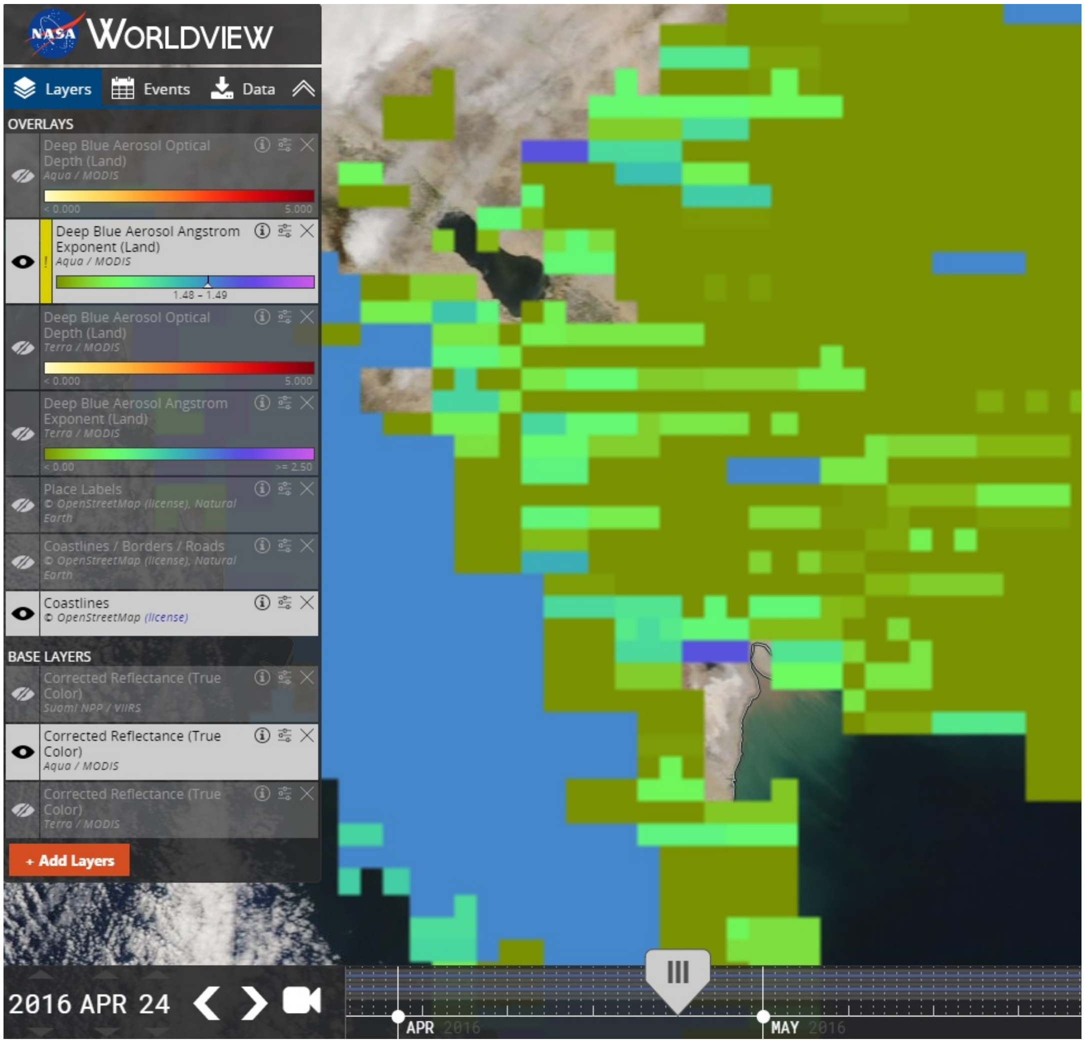


Fig 5-5: The MODIS instrument onboard the Aqua satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~1330 PST on April 24, 2016. Green colors indicate thicker aerosols. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

FIGURE 5-6
TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY APRIL 25, 2016

Fig 5-6: The MODIS instrument onboard the Terra satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~1030 PST on April 25, 2016. Green colors indicate thicker aerosols. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

FIGURE 5-7
AQUA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY APRIL 25, 2016

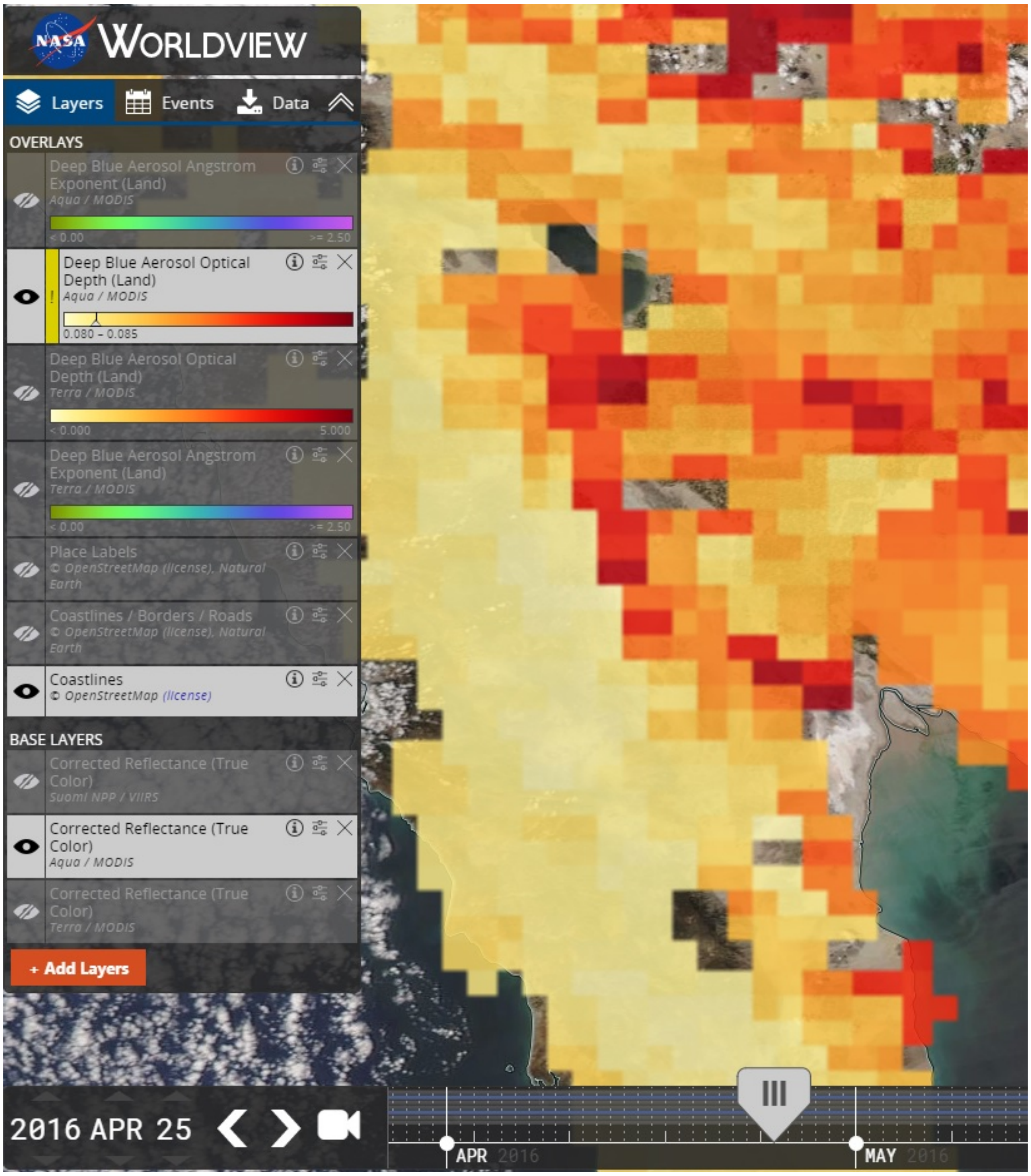


Fig 5-7: The MODIS instrument onboard the Aqua satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~1330 PST on April 25, 2016. Darker colors indicate thicker aerosols. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[10] **Tables 5-1 through 5-4** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding stations. The Brawley monitor shows peak hourly concentrations following or during the period of high upstream wind speeds.

[10] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

The Brawley station does not have its own meteorological instruments, as does Calexico, Niland, and Westmorland.

TABLE 5-1
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR BRAWLEY APRIL 24, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				FISH CREEK MOUNTAINS (FHCC1)				BRAWLEY	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m³)
56	9	310		53	5	310		050	18	205	25	026	12	198	17	0000	19
156	7	300		153	6	300		150	15	209	24	126	11	199	16	0100	27
256	5	50		253	6	290		250	13	209	20	226	9	192	16	0200	33
356	3	200		353	0	0		350	11	206	19	326	10	193	14	0300	19
456	8	240		453	0	0		450	11	206	17	426	10	193	15	0400	31
556	0	0		553	5	240		550	11	200	16	526	11	199	14	0500	48
656	5	250		653	0	0		650	16	198	23	626	9	198	15	0600	33
756	0	0		753	0	0		750	14	204	24	726	6	182	10	0700	30
856	3	260		853	3	VR		850	12	198	23	826	3	213	9	0800	29
956	5	VR		953	7	80		950	15	234	26	926	5	227	9	0900	19
1056	9	170		1053	5	VR		1050	17	243	28	1026	3	226	11	1000	22
1156	13	150		1153	5	VR		1150	17	208	27	1126	7	171	13	1100	25
1256	8	160	17	1253		M		1250	15	214	26	1226	11	174	17	1200	64
1356	11	180	22	1353	6	VR	17	1350	17	220	31	1326	8	227	15	1300	35
1456	23	270	29	1453	9	170		1450	20	235	35	1426	24	201	33	1400	33
1556	28	260	34	1553	13	230		1550	23	213	44	1526	22	197	32	1500	113
1656	33	260	45	1653	26	260	32	1650	25	226	39	1626	19	225	35	**1600**	**653**
1756	32	260	39	1753	23	260	31	1750	24	207	39	1726	17	227	33	**1700**	**708**
1856	26	260	33	1853	30	260	36	1850	18	216	35	1826	9	186	24	**1800**	**995**
1956	25	250	34	1953	22	260	31	1950	25	236	36	1926	10	279	26	**1900**	**762**
2056	28	260	36	2053	24	250	32	2050	26	235	43	2026	5	324	24	**2000**	**672**
2156	32	250	43	2153	23	250	33	2150	26	230	41	2126	8	252	15	**2100**	**356**
2256	37	250	45	2253	23	250	32	2250	17	235	38	2226	2	70	8	**2200**	**332**
2356	31	240	39	2353	25	240	36	2350	21	243	35	2326	9	275	21	**2300**	**179**

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for the Fish Creek Mountains (FHCC1) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees

TABLE 5-2
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND APRIL 24, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				WESTMORLAND				WESTMORLAND	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m^3)
56	9	310		53	5	310		050	18	205	25	0000	6.3	305		0000	22
156	7	300		153	6	300		150	15	209	24	0100	6.1	288		0100	23
256	5	50		253	6	290		250	13	209	20	0200	4.8	287		0200	22
356	3	200		353	0	0		350	11	206	19	0300	2.7	313		0300	27
456	8	240		453	0	0		450	11	206	17	0400	1.9	250		0400	33
556	0	0		553	5	240		550	11	200	16	0500	2.3	132		0500	20
656	5	250		653	0	0		650	16	198	23	0600	2	185		0600	21
756	0	0		753	0	0		750	14	204	24	0700	2.6	296		0700	28
856	3	260		853	3	VR		850	12	198	23	0800	3.3	322		0800	64
956	5	VR		953	7	80		950	15	234	26	0900	2.2	43		0900	19
1056	9	170		1053	5	VR		1050	17	243	28	1000	3.7	98		1000	22
1156	13	150		1153	5	VR		1150	17	208	27	1100	5.7	98		1100	25
1256	8	160	17	1253		M		1250	15	214	26	1200	7.7	146		1200	26
1356	11	180	22	1353	6	VR	17	1350	17	220	31	1300	9.5	160		1300	59
1456	23	270	29	1453	9	170		1450	20	235	35	1400	9.6	206		1400	87
1556	28	260	34	1553	13	230		1550	23	213	44	1500	11.6	232		**1500**	**270**
1656	33	260	45	1653	26	260	32	1650	25	226	39	1600	11.5	242		**1600**	**780**
1756	32	260	39	1753	23	260	31	1750	24	207	39	1700	12.9	238		**1700**	**797**
1856	26	260	33	1853	30	260	36	1850	18	216	35	1800	12.7	234		**1800**	**995**
1956	25	250	34	1953	22	260	31	1950	25	236	36	1900	10.6	247		**1900**	**449**
2056	28	260	36	2053	24	250	32	2050	26	235	43	2000	6.5	268		**2000**	**150**
2156	32	250	43	2153	23	250	33	2150	26	230	41	2100	6	233		**2100**	**139**
2256	37	250	45	2253	23	250	32	2250	17	235	38	2200	10.3	230		**2200**	**57**
2356	31	240	39	2353	25	240	36	2350	21	243	35	2300	9.3	245		**2300**	**116**

*****Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Westmorland does not measure gusts. Wind speeds = mph; Direction = degrees

TABLE 5-3
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR BRAWLEY APRIL 25, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				FISH CREEK MOUNTAINS (FHCC1)				BRAWLEY	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m³)
56	29	250		53	23	240	34	050	23	235	36	026	24	267	37	0000	63
156	28	250	37	153	21	250	28	150	25	236	42	126	12	294	32	**0100**	**294**
256	15	240		253	7	250		250	27	229	47	226	8	300	26	**0200**	**152**
356	15	240	24	353	17	250	24	350	26	231	47	326	17	309	33	**0300**	**196**
456	16	250		453	17	260		450	29	225	46	426	17	240	28	0400	91
556	30	250	37	553	22	250	30	550	24	224	43	526	15	260	36	**0500**	**111**
656	28	240		653	21	260	28	650	29	221	48	626	15	268	42	**0600**	**284**
756	23	240	30	753	21	250	29	750	26	220	45	726	3	123	28	**0700**	**242**
856	13	300		853	15	260	26	850	27	224	46	826	21	256	39	**0800**	**328**
956	15	260	33	953	13	260	25	950	26	226	43	926	14	278	39	**0900**	**431**
1056	23	250	34	1053	18	250	26	1050	25	228	45	1026	11	289	40	**1000**	**300**
1156	28	230	33	1153	20	240	30	1150	31	226	51	1126	11	275	39	**1100**	**181**
1256	30	240	37	1253	23	250	34	1250	30	223	45	1226	15	313	34	**1200**	**148**
1356	32	250	40	1353	31	250	44	1350	22	224	39	1326	15	305	41	**1300**	**270**
1456	32	250	45	1453	34	260	45	1450	20	223	37	1426	29	258	50	**1400**	**421**
1556	32	250	38	1553	25	250	40	1550	18	234	30	1526	26	263	50	**1500**	**477**
1656	33	240	41	1653	30	250	38	1650	15	242	29	1626	26	253	50	**1600**	**397**
1756	31	250	38	1753	25	250	37	1750	22	228	32	1726	15	227	47	**1700**	**797**
1856	23	280		1853	14	290		1850	25	233	44	1826	15	255	35	**1800**	**723**
1909	23	280	31	1919	25	290	31	1950	24	240	40	1926	12	315	29	**1900**	**612**
2056	21	260		2053	18	250		2050	25	235	39	2026	15	254	31	**2000**	**198**
2156	16	250		2153	16	250		2150	27	204	43	2126	10	226	19	2100	94
2256	18	250		2253	9	250		2250	26	220	39	2226	15	213	22	2200	16
2356	11	280		2353	8	280		2350	28	201	44	2326	15	211	23	2300	21

*****Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for the Fish Creek Mountains (FHCC1) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees

TABLE 5-4
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR CALEXICO APRIL 25, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				CALEXICO				CALEXICO	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m^3)
56	29	250		53	23	240	34	050	23	235	36	0000	16.5	284		**0000**	**247**
156	28	250	37	153	21	250	28	150	25	236	42	0100	18.0	285		**0100**	**258**
256	15	240		253	7	250		250	27	229	47	0200	16.1	275		**0200**	**332**
356	15	240	24	353	17	250	24	350	26	231	47	0300	17.3	272		**0300**	**173**
456	16	250		453	17	260		450	29	225	46	0400	12.7	287		**0400**	**126**
556	30	250	37	553	22	250	30	550	24	224	43	0500	15.0	282		**0500**	**355**
656	28	240		653	21	260	28	650	29	221	48	0600	9.3	272		**0600**	**200**
756	23	240	30	753	21	250	29	750	26	220	45	0700	7.2	334		0700	97
856	13	300		853	15	260	26	850	27	224	46	0800	12.9	284		**0800**	**136**
956	15	260	33	953	13	260	25	950	26	226	43	0900	15.9	284		**0900**	**204**
1056	23	250	34	1053	18	250	26	1050	25	228	45	1000	14.5	277		**1000**	**134**
1156	28	230	33	1153	20	240	30	1150	31	226	51	1100	14.6	289		1100	96
1256	30	240	37	1253	23	250	34	1250	30	223	45	1200	17.0	291		**1200**	**159**
1356	32	250	40	1353	31	250	44	1350	22	224	39	1300	15.8	274		**1300**	**109**
1456	32	250	45	1453	34	260	45	1450	20	223	37	1400	16.6	274		**1400**	**208**
1556	32	250	38	1553	25	250	40	1550	18	234	30	1500	17.3	281		**1500**	**200**
1656	33	240	41	1653	30	250	38	1650	15	242	29	1600	17.7	270		**1600**	**358**
1756	31	250	38	1753	25	250	37	1750	22	228	32	1700	17.0	263		**1700**	**330**
1856	23	280		1853	14	290		1850	25	233	44	1800	13.8	281		**1800**	**157**
1909	23	280	31	1919	25	290	31	1950	24	240	40	1900	17.8	284		**1900**	**139**
2056	21	260		2053	18	250		2050	25	235	39	2000	14.2	272		2000	37
2156	16	250		2153	16	250		2150	27	204	43	2100	12.8	264		2100	45
2256	18	250		2253	9	250		2250	26	220	39	2200	6.3	266		2200	28
2356	11	280		2353	8	280		2350	28	201	44	2300	2.9	305		2300	27

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Calexico does not measure gusts. Wind speeds = mph; Direction = degrees

TABLE 5-5
WIND SPEEDS AND PM$_{10}$ CONCENTRATIONS FOR NILAND APRIL 25, 2016

FISH CREEK MOUNTAINS (FHCC1)				OCOTILLO WELLS (AS938)				NAVAL TEST BASE				NILAND				NILAND	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM$_{10}$ (µg/m^3)
026	24	267	37	0000	25	337	43	0000	29	237		0000	24	271		**0000**	**139**
126	12	294	32	0106	19	315	31	0100	23	245		0100	26	267		**0100**	**181**
226	8	300	26	0200	17	307	25	0200	23	250		0200	25	265		**0200**	**113**
326	17	309	33	0300	14	323	25	0300	15	276		0300	21	266		0300	88
426	17	240	28	0400	24	8	38	0400	17	252		0400	15	261		0400	77
526	15	260	36	0500	17	333	38	0500	27	241		0500	17	261		**0500**	**178**
626	15	268	42	0600	25	324	42	0600	31	243		0600	24	251		**0600**	**240**
726	3	123	28	0700	22	316	36	0700	29	242		0700	25	256		**0700**	**403**
826	21	256	39	0800	25	322	44	0800	27	249		0800	20	256		**0800**	**287**
926	14	278	39	0900	22	306	40	0900	29	245		0900	20	265		**0900**	**333**
1026	11	289	40	1000	18	315	31	1000	28	239		1000	24	266		**1000**	**280**
1126	11	275	39	1100	20	323	40	1100	27	229		1100	27	264		1100	
1226	15	313	34	1200	21	329	39	1200	25	237		1200	25	260		**1200**	**140**
1326	15	305	41	1300	27	315	42	1300	31	236		1300	25	255		**1300**	**135**
1426	29	258	50	1400	23	300	45	1400	36	234		1400	24	257		**1400**	**196**
1526	26	263	50	1500	24	299	42	1500	35	239		1500	28	258		**1500**	**516**
1626	26	253	50	1600	22	302	38	1600	34	239		1600	32	259		1600	
1726	15	227	47	1700	19	329	34	1700	37	238		1700	32	260		**1700**	**685**
1826	15	255	35	1800	17	315	33	1800				1800	32	266		**1800**	**596**
1926	12	315	29	1900	15	334	26	1900	17	266		1900	26	295		**1900**	**227**
2026	15	254	31	2000	16	315	26	2000	19	229		2000	16	281		2000	30
2126	10	226	19	2100	15	336	27	2100	15	254		2100	13	261		2100	28
2226	15	213	22	2200	14	340	22	2200	11	257		2200	4	269		2200	59
2326	15	211	23	2300	15	306	23	2300	11	292		2300	9	264		2300	23

*Wind data for the (former) Naval Test Base from AQMIS2. Wind data FOR Ocotillo Wells (AS938) and Fish Creek Mountains (FHCC1) from the University of Utah's MesoWest system. Niland wind data from the EPA's AQS system. Wind speeds = mph; Direction = degrees

TABLE 5-6
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND APRIL 25, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				FISH CREEK MOUNTAINS (FHCC1)				WESTMORLAND				WESTMORLAND	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m³)
56	29	250		53	23	240	34	026	24	267	37	0000	12.8	275		0000	252
156	28	250	37	153	21	250	28	126	12	294	32	0100	8.8	269		0100	177
256	15	240		253	7	250		226	8	300	26	0200	12.9	293		0200	230
356	15	240	24	353	17	250	24	326	17	309	33	0300	12	279		0300	182
456	16	250		453	17	260		426	17	240	28	0400	5.8	262		0400	50
556	30	250	37	553	22	250	30	526	15	260	36	0500	2.4	16		0500	217
656	28	240		653	21	260	28	626	15	268	42	0600	10.1	283		0600	548
756	23	240	30	753	21	250	29	726	3	123	28	0700	17.9	277		0700	239
856	13	300		853	15	260	26	826	21	256	39	0800	20.2	281		0800	421
956	15	260	33	953	13	260	25	926	14	278	39	0900	20	283		0900	420
1056	23	250	34	1053	18	250	26	1026	11	289	40	1000	19.1	288		1000	275
1156	28	230	33	1153	20	240	30	1126	11	275	39	1100	17.6	291		1100	90
1256	30	240	37	1253	23	250	34	1226	15	313	34	1200	14.3	291		1200	103
1356	32	250	40	1353	31	250	44	1326	15	305	41	1300	15.7	281		1300	202
1456	32	250	45	1453	34	260	45	1426	29	258	50	1400	17.1	283		1400	263
1556	32	250	38	1553	25	250	40	1526	26	263	50	1500	15.4	272		1500	423
1656	33	240	41	1653	30	250	38	1626	26	253	50	1600	15.3	270		1600	374
1756	31	250	38	1753	25	250	37	1726	15	227	47	1700	16.4	294		1700	567
1856	23	280		1853	14	290		1826	15	255	35	1800	21.1	275		1800	596
1909	23	280	31	1919	25	290	31	1926	12	315	29	1900	18.4	280		1900	86
2056	21	260		2053	18	250		2026	15	254	31	2000	10.8	270		2000	33
2156	16	250		2153	16	250		2126	10	226	19	2100	6.2	267		2100	79
2256	18	250		2253	9	250		2226	15	213	22	2200	2.9	247		2200	25
2356	11	280		2353	8	280		2326	15	211	23	2300	1.7	287		2300	25

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for the Fish Creek Mountains from the University of Utah's MesoWest system. Westmorland does not measure gusts. Wind speeds = mph; Direction = degrees

Figure 5-8 is a graphic depiction that combines the HYSPLIT trajectory, upstream wind speeds, and important peak concentration times leading up to the exceedances at the Brawley and Westmorland monitors on April 24, 2016. Winds travelled across the mountains of San Diego County and down the desert slopes at points like Mountain Springs Grade to the valley floor near Sunrise-Ocotillo. As mentioned above, wind, blowing dust and sand advisories were issued by both the San Diego and Phoenix NWS office when local airports and upstream sites measured winds at or above 25 mph. On April 24, 2016, by mid-afternoon measured elevated high winds, at or above 25 mph carried entrained fugitive dust into Imperial County. PM_{10} concentrations elevated in response to the entrained dust affecting air quality and causing an exceedance of the NAAQS.

FIGURE 5-8
EXCEEDANCE TIMELINE APRIL 24, 2016

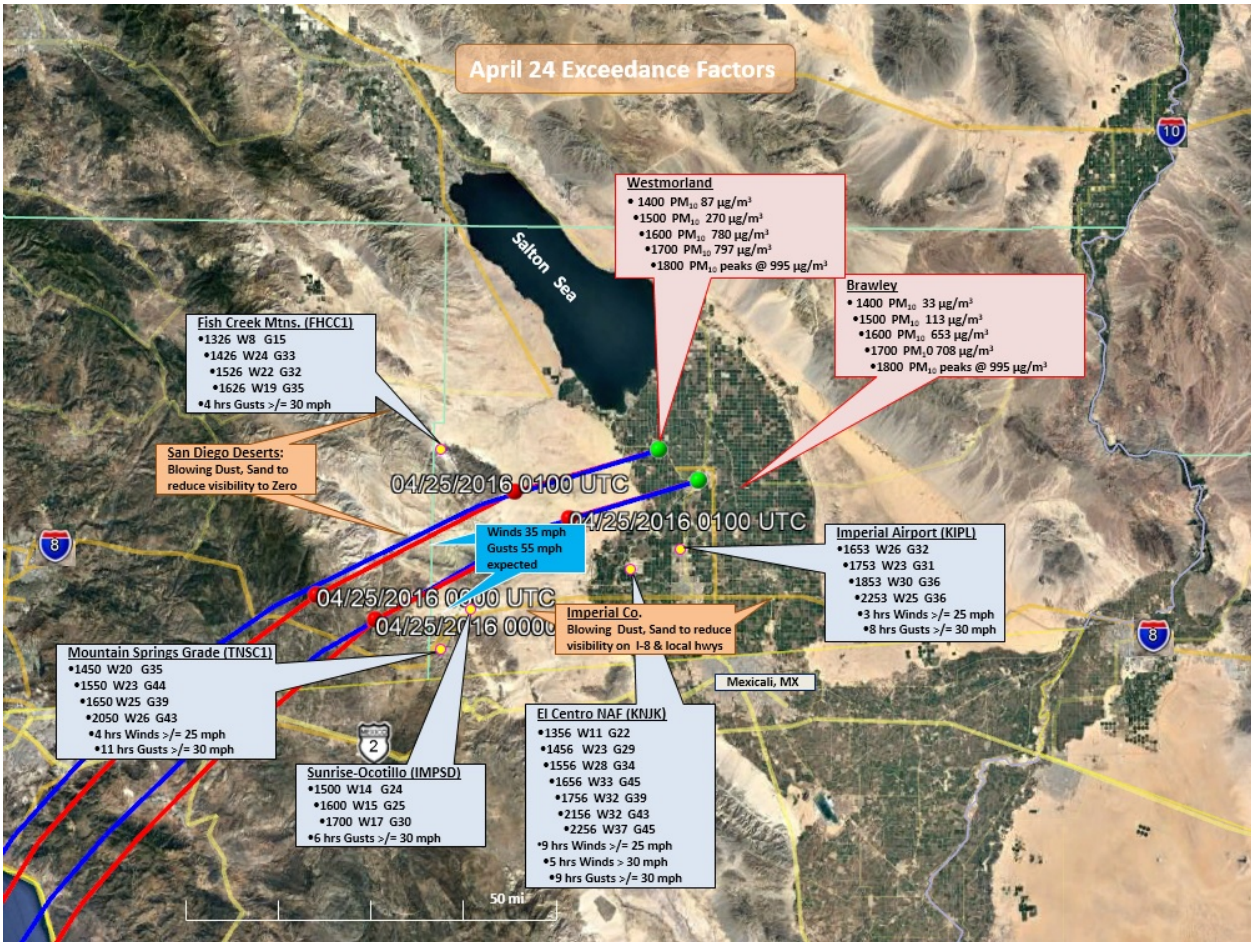


Fig 5-8: High winds at upstream sites helped entrain dust on the western edge of the Sonoran Desert west of Brawley and Westmorland on April 24, 2016. Air quality data is from the EPA's AQS data bank. See individual wind site graphs in **Appendix B** for data source. The 6-hour HYSPLIT back-trajectory ends at 1800 PST. Red trajectory depicts airflow at the 10m level; blue is 100m. Times given are for the 10m trajectory. Generated through NOAA's Air Resources Laboratory. Google Earth base map

Figure 5-9 depicts the key factors related to the exceedances at the Brawley, Calexico, Niland, and Westmorland monitors on April 25, 2016. As mentioned previously, high winds continued from one of a series of Pacific Weather systems moving through California on April 24, 2016 through April 25, 2016. A predominantly westerly shift in wind direction provided the conditions for entrained windblown dust to affect all monitoring sites in Imperial County. As a result, wind and blowing dust and sand advisories continued through April 25, 2016 by both the San Diego and Phoenix NWS offices. Although the El Centro monitor did not measure an exceedance of the NAAQS, the station measured elevated concentration of PM_{10} (152 µg/m^3).

FIGURE 5-9
EXCEEDANCE TIMELINE APRIL 25, 2016

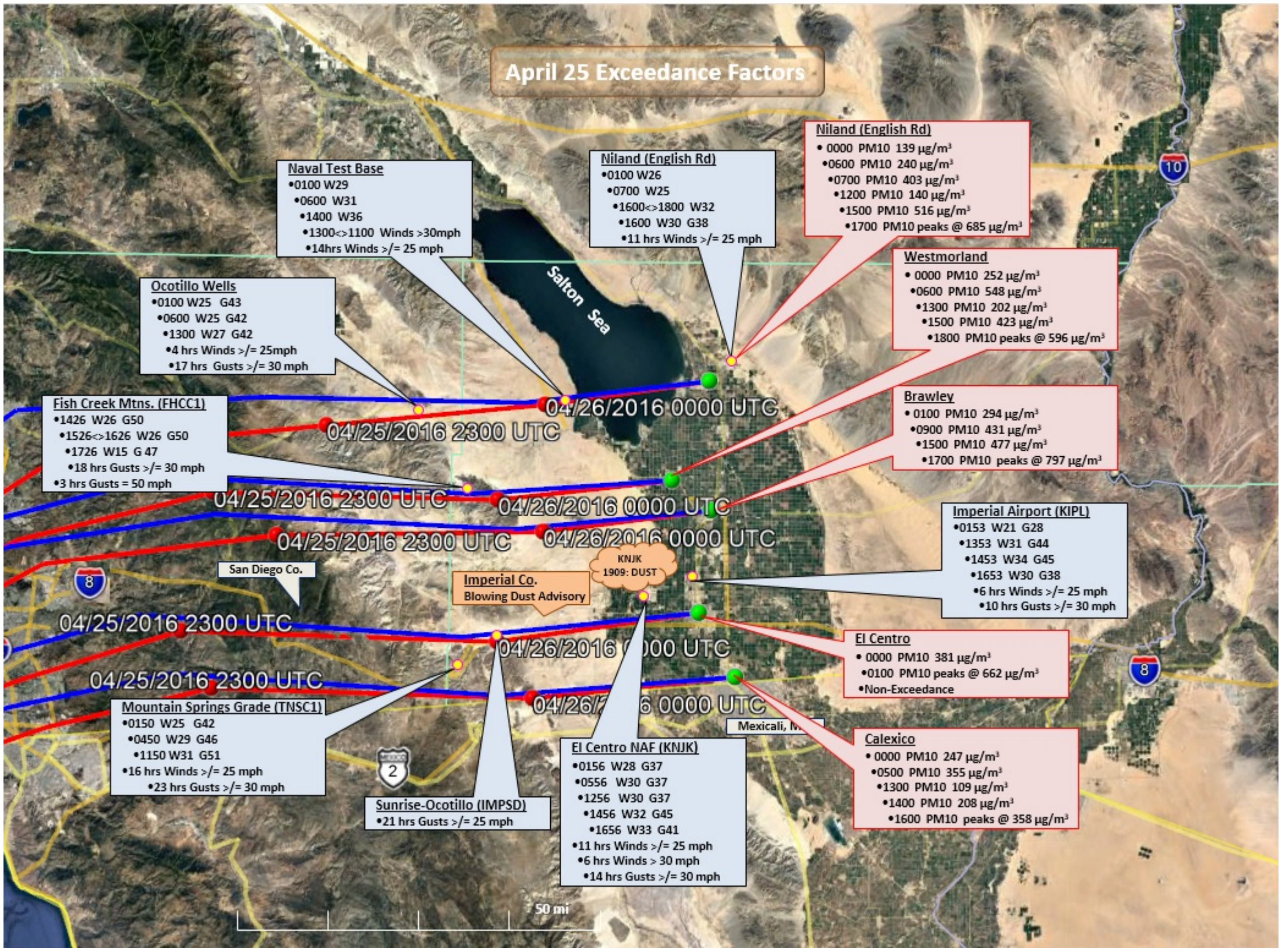


Fig 5-9: Winds remained gusty on April 25, 2016 as they shifted almost due westerly as depicted in the HYSPLIT back-trajectories. Air quality data is from the EPA's AQS data bank. See individual wind site graphs in **Appendix B** for data source. The 12-hour HYSPLIT back-trajectory ends at 1700 PST April 25, 2016. Red trajectory depicts airflow at the 10m level; blue is 100m. Times given are for the 10m trajectory. Generated through NOAA's Air Resources Laboratory. Google Earth base map

Figures 5-10 through 5-14 depicts PM_{10} concentrations and wind speeds over a 96-hour period at Brawley, Calexico, El Centro, Niland, and Westmorland. Fluctuations in hourly concentrations at Brawley over 96 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL).

FIGURE 5-10
BRAWLEY PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

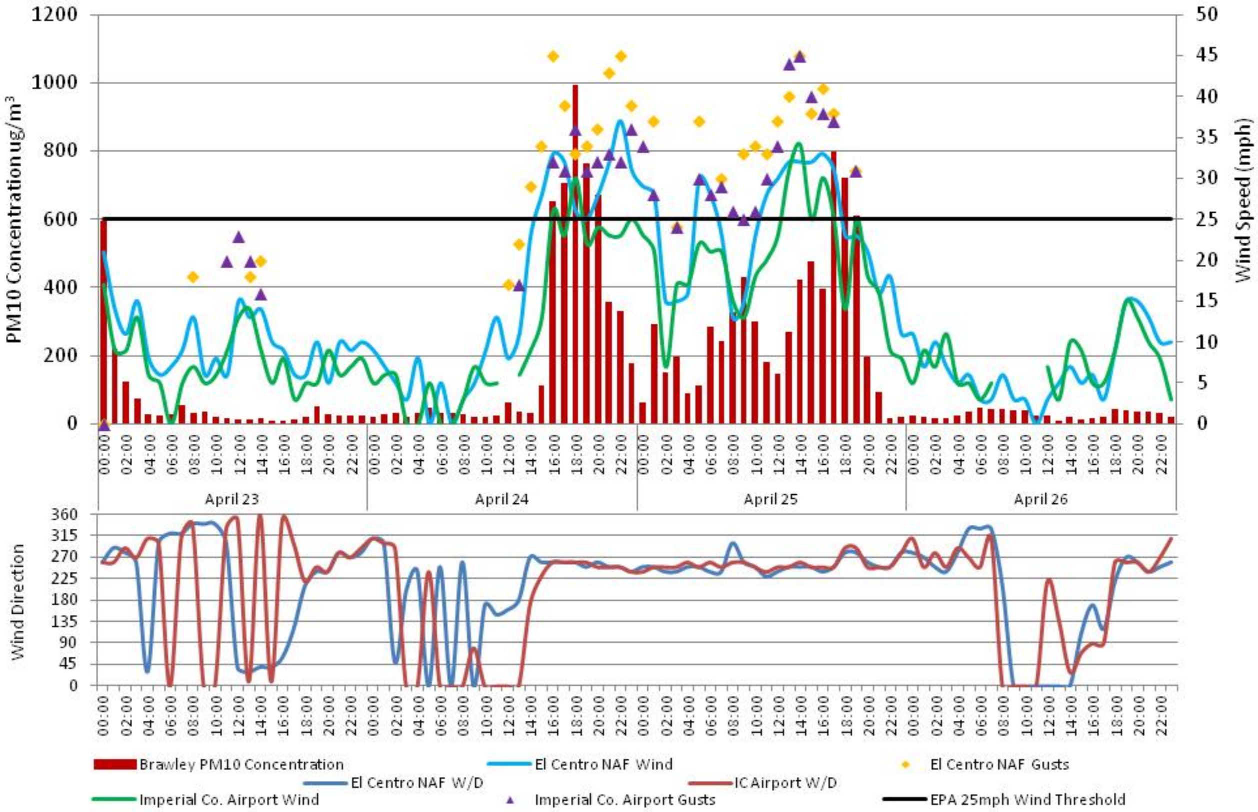


Fig 5-10: Fluctuations in hourly concentrations over 96 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL). The Brawley station does not measure wind speed. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-11
CALEXICO PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

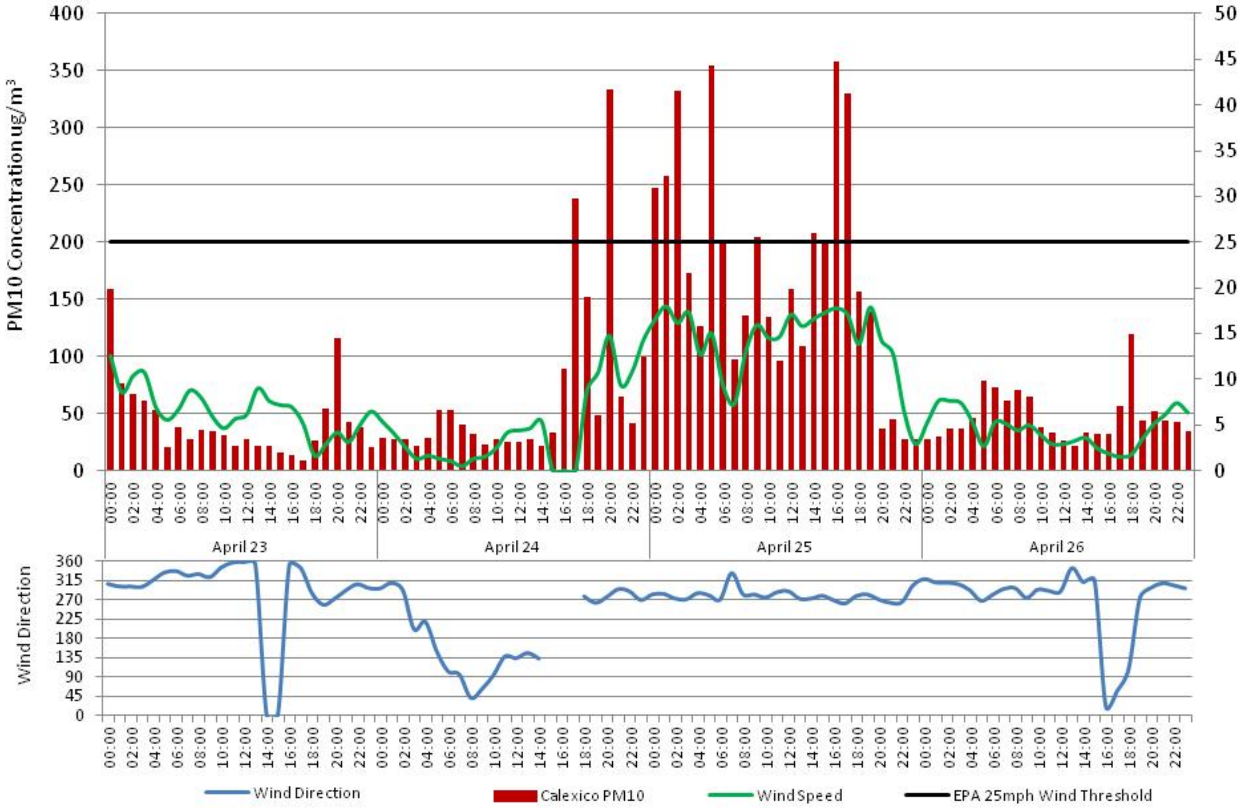


Fig 5-11: Winds at Calexico did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-12
EL CENTRO PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

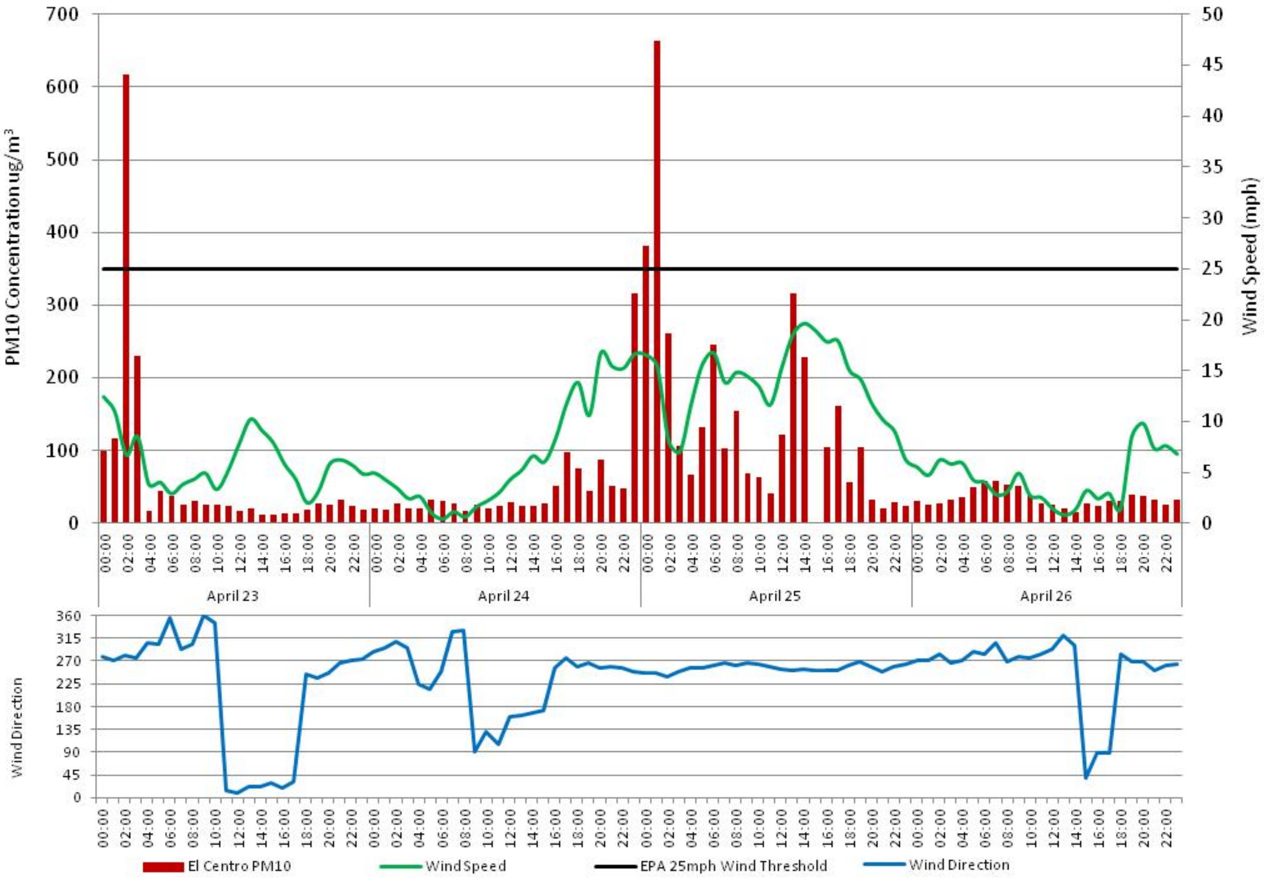


Fig 5-12: Winds at El Centro did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. El Centro was just under the NAAQS threshold and did not exceed. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-13
NILAND PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

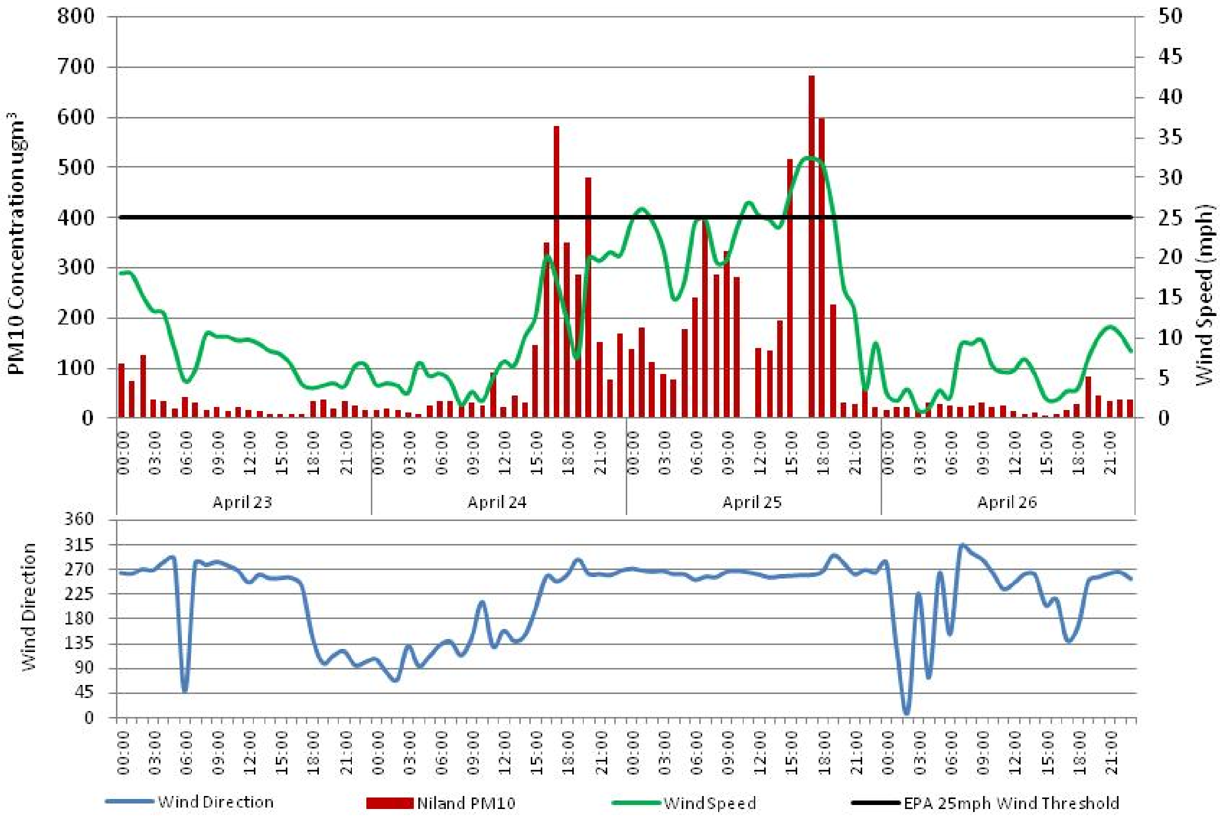


Fig 5-13: Winds at Niland surpassed the 25 mph wind threshold. An increase in wind speeds shows a positive correlation with increased hourly concentrations. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-14
WESTMORLAND PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

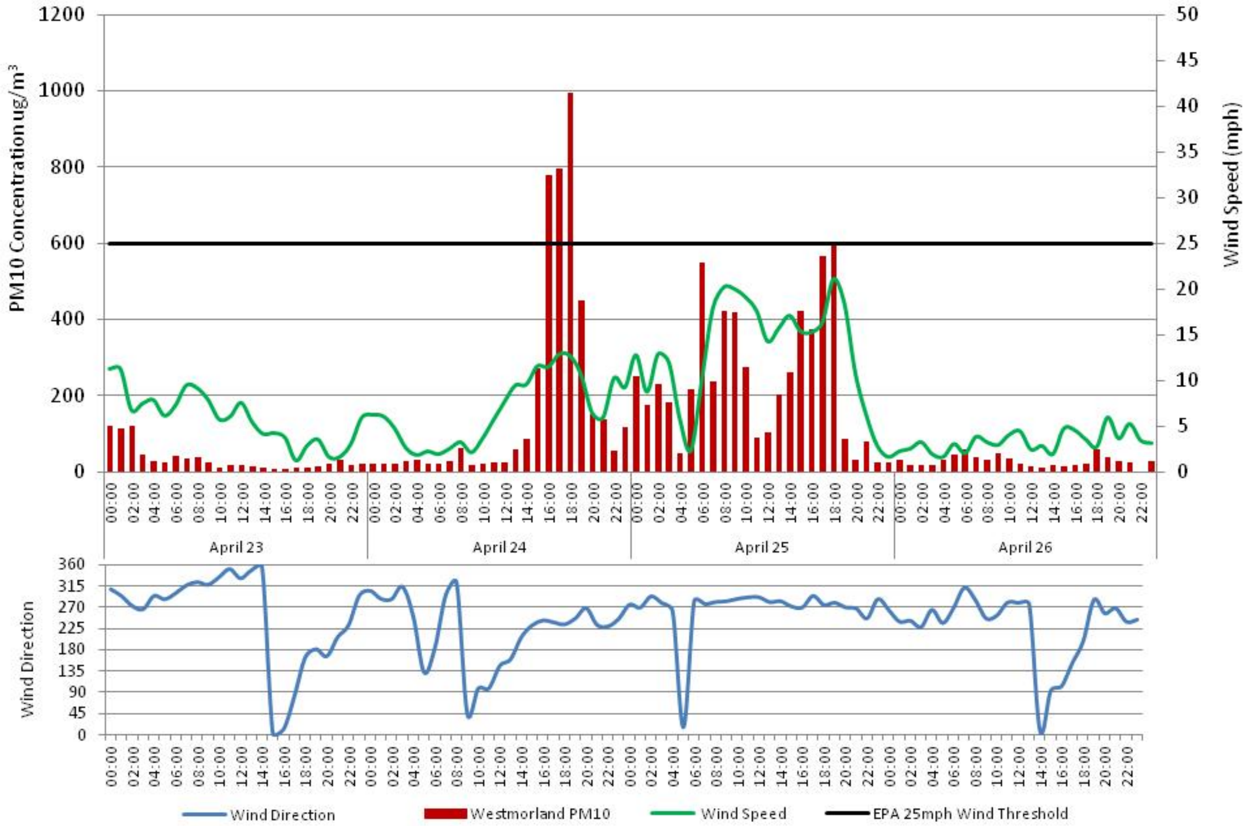


Fig 5-14: Winds at Westmorland did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-15 depicts the relationship between the 96-hour PM_{10} fluctuations by the Brawley, Calexico, Niland, and Westmorland monitors together with upstream wind speeds. A positive correlation can be seen, between an increase in wind speeds and gusts with increased concentrations at the monitors. **Appendix C** contains additional graphs illustrating the relationship between PM_{10} concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

FIGURE 5-15
PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

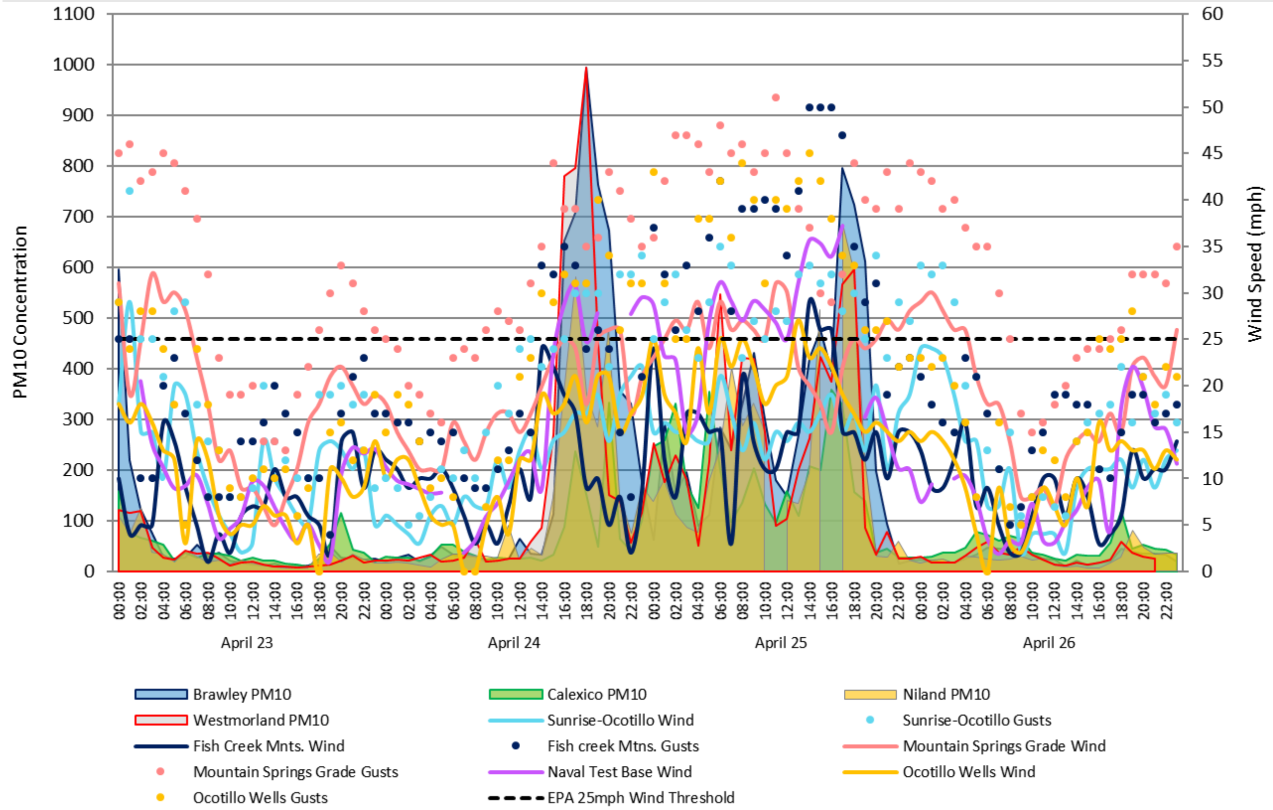


Fig 5-15: This graph depicts the 96-hour PM_{10} fluctuations by the Brawley, Westmorland, and Niland monitors together with upstream wind speeds, along with wind speeds measured at Westmorland and Niland. A positive correlation between increases in wind speeds can be seen, particularly with gusts at KNJK, KIPL, and Sunrise-Ocotillo. Black line indicates the 25 mph threshold

Figure 5-16 compares the 96-hour concentrations at Calexico, El Centro, Brawley, Westmorland, and Niland with visibility[11] at local airfields, April 23, 2016 through April 26, 2016. Generally, drops in visibility correspond to highest hourly concentrations at the monitors.

[11] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can “see”. The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm.

FIGURE 5-16
96 HOUR PM_{10} CONCENTRATIONS AND VISIBILITY

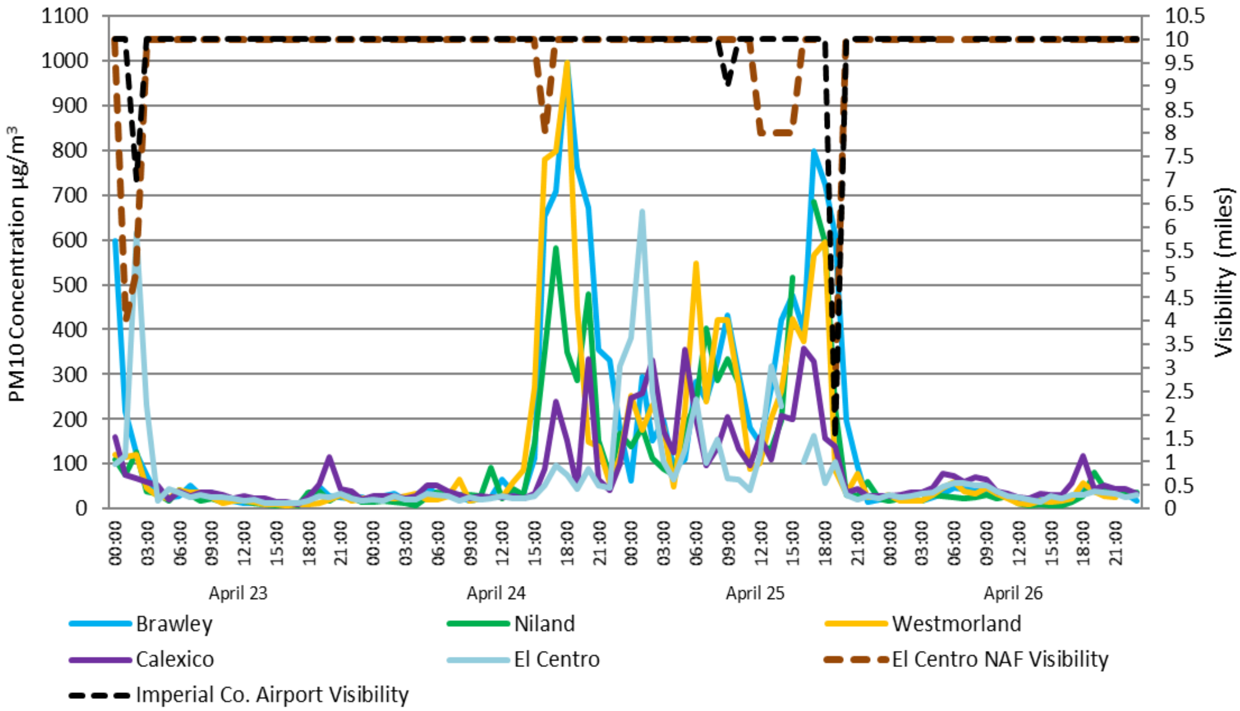


Fig 5-16: Visibility as reported from El Centro NAF (KNJK) and Imperial County Airport (KIPL) shows that visibility dipped significantly at KIPL prior to peak concentrations at Brawley, Westmorland, and Niland. Visibility data from the NCEI's QCLCD data bank

The NWS Phoenix office issued a Blowing Dust Advisory at 113pm PST on April 25, 2016 advising of reduced visibility down to one mile or less. The suspended dust affected air quality in the Imperial County. **Figure 5-17** shows the Air Quality Index[12] for Calexico on April 25, 2016. Calexico's air quality remained in the "Yellow" or Moderate range (PM_{10} 51-100 µg/m^3) until entering the "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3) at 300 p.m. where it remained for the rest of the day. An Air Quality Alert was issued at 8:00am PST notifying the public that air quality in the Brawley area had dropped to Unhealthy. Niland and Westmorland were classified as Unhealthy for Sensitive Groups, while Calexico and El Centro were listed as Moderate, according to the alert. At 500pm PST a second Air Quality Alert was issued notifying the public that air quality in the Brawley area had dropped to Very Unhealthy. Both Niland and Westmorland were classified as Unhealthy, while El Centro and Calexico were classified as Unhealthy for Sensitive Groups (**Appendix A**).

[12] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health affects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://airnow.gov/index.cfm?action=aqibasics.aqi

FIGURE 5-17
AIR QUALITY INDEX FOR CALEXICO APRIL 25, 2016

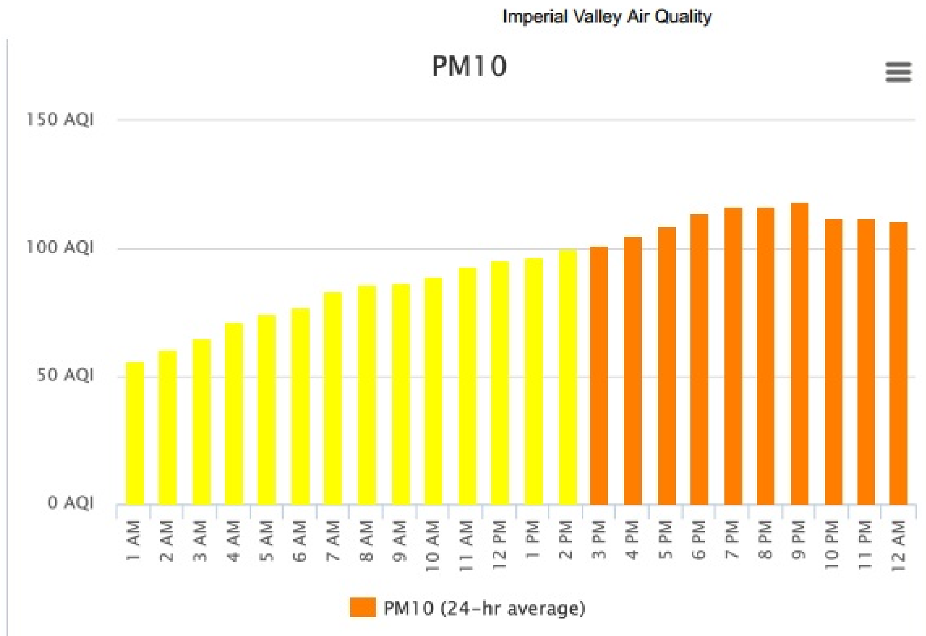


Fig 5-17: The depiction of the affect upon air quality is inferred by this figure when the AQI is at moderate level throughout most of the day and unhealthy levels during the evening hours. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the steep pressure gradient accompanying the low-pressure system that passed through the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley, Calexico, Niland, and Westmorland monitors on April 24, 2016 and April 25, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} entrained by strong westerly winds into the lower atmosphere causing a change in air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County. Combined, the information demonstrates that the elevated PM_{10} concentrations measured on April 24, 2016 and April 25, 2016 coincided with high wind speeds (at or above 25 mph) and that gusty west winds were transported over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-18
APRIL 24, 2016 AND APRIL 25, 2016 WIND EVENT TAKE AWAY POINTS

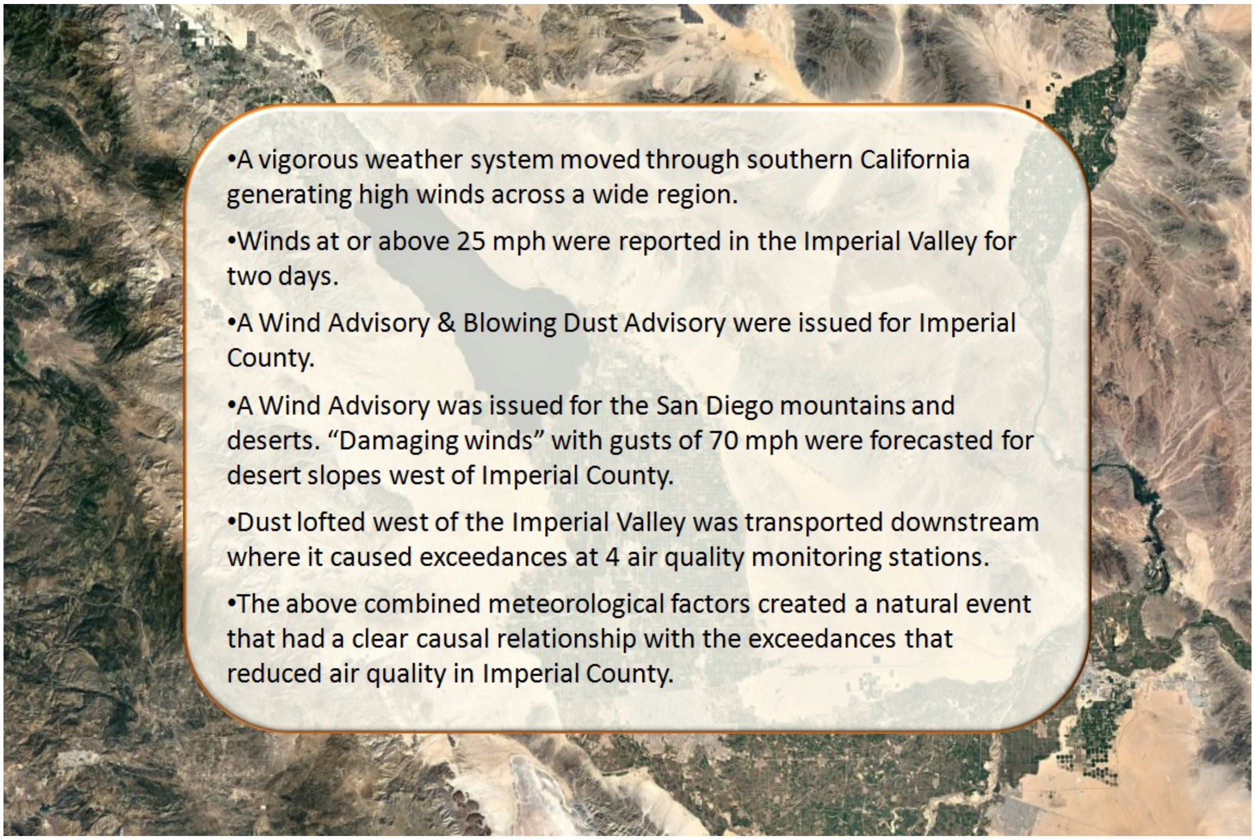


Fig 5-18: Illustrates the factors that qualify April 24, 2016 and April 25, 2016 as a natural event which affected air quality

VI Conclusions

The PM_{10} exceedance that occurred on April 24, 2016 and April 25, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-33
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	54-77
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	34-45
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	46-53
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	34-77

VI.1 Affects Air Quality

The preamble to the revised EER states that an event has affected air quality if the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the April 24, 2016 and April 25, 2016 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 defines an exceptional event as an event that must be "not reasonably controllable or preventable" (nRCP). The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. A natural wind event, which transports dust from natural open deserts, meets the nRCP, when sources are controlled by BACM and when human activity plays little to no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, strong gusty west winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley and Westmorland monitors caused by naturally occurring strong gusty westerly winds transported windblown dust into Imperial County and other parts of southern California from areas located within the San Diego Mountains. These facts provide strong evidence that the PM_{10} exceedance at the Brawley, Calexico, Niland and Westmorland monitors on April 24, 2016 and April 25, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM_{10} exceedances that occurred at Brawley, Calexico, Niland, and Westmorland on April 24, 2016 and April 25, 2016, were caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with the passage of low pressure system that moved through the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Brawley, Westmorland, and Niland during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} at the Brawley, Calexico, Niland, and Westmorland monitoring stations on April 24, 2016 and April 25, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on April 24, 2016 and April 25, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley, Calexico, Niland, and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around April 24 and April 25, 2016. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.